# Montana outdoors

May/June 1977
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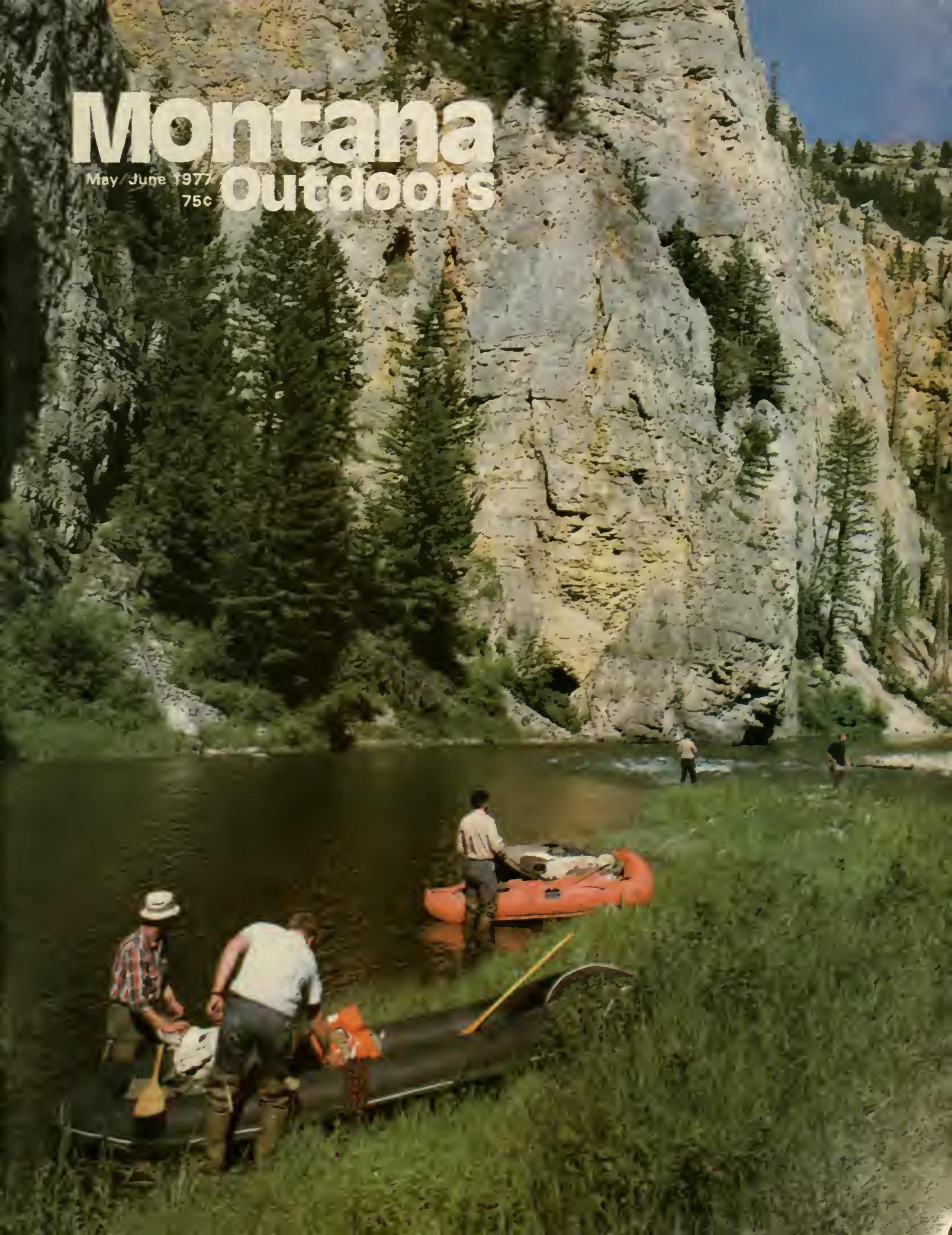

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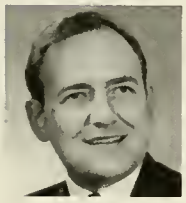

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*THE COVER:* Montana can be a paradise for river floaters. Dozens of rivers offer exciting and peaceful floating, with the Smith River (front cover, F&G photo: Steve Bayless) one of the most popular streams. Turn to "The Floater's Guide" on page 13 for the most comprehensive guide to outdoor recreation ever published in *Montana Outdoors*. On the back cover, Dorothy Shepherd displays trout caught during an annual float trip on the Big Hole River conducted by the Big Brothers and Sisters of Butte. In 1976, 30 boats carried 76 passengers down the trout-rich Big Hole during this annual floating excursion. Back cover photo: Jerry Manley

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ASHTON'S BUTTE

# The Director's Column

As this issue of *Montana Outdoors* goes to press, the Dept. of Fish and Game and other state agencies are developing plans to help Montana cope with the major drought that appears imminent. Montana may not suffer as severely as other western states, but predictions based on current snow pack and precipitation probabilities for the spring months are indeed gloomy. Stream flows in the Yellowstone and Missouri rivers, and in all rivers in the western part of the state, *could* reach the lowest levels ever recorded. If this occurs, the impact on wildlife and wild land resources could be devastating.

Some obvious impacts might be forest and range fires, dry river beds and severe shortages of hydroelectric power. Other more subtle impacts affecting wildlife might be reduced production of forage on range lands, poor spawning success and reduced water quality in many rivers because of inadequate dilution of pollutants.

And one wonders how a drought of this magnitude will affect the Montana political climate. Will current and potential water consumers become more militant and demanding? Will there be expanded pressure for destructive water development projects and large impoundments? Or, in the face of such shortages, will Montanans realize the importance of conserving our water resources—of maintaining adequate, minimum flows in our precious streams.

To help assure that the right lessons are learned from this crisis, the Montana Dept. of Fish and Game will be doing its utmost to document the effects of the drought. We will dedicate all available resources to the careful monitoring of aquatic and terrestrial habitats and to the study and observation of changes in fish and wildlife populations. We will cooperate with federal and other state agencies, and the universities, which will also be evaluating the drought impacts.

We can't stop the drought. But perhaps we can take advantage of it to learn some vital lessons that will help us to do a better job of protecting and managing water, wildlife and wild land resources in the future.

Robert F. Wambach

# Controlling Mosquitoes

## every Montanan feels the mosquito's bite

by Randall F. Moy
illustrations by Vern Craig

WITHOUT BLOOD, mammals can't exist. But neither can those maddening clouds of mosquitoes. In the female mosquito's quest for a "blood meal," she creates a wake of unbearable misery which constitutes a health hazard to people and livestock alike.

Because of mosquitoes:

- Calves in the Milk River Valley in northeastern Montana may lose 75 or more pounds, with greater losses in older cattle.
- Revenue from tourism is lost, such as the near bankruptcy of a northeastern Montana resort.
- Golf courses, parks and other outdoor recreational areas become unbearable.
- Some people and dozens of domestic animals contract encephalitis every year in Montana.
- Thousands of pounds of deadly chemicals are spread over Montana each year, resulting in the direct death of some wild animals and secondary impact on others.
- Millions of painful stings are inflicted, causing much suffering, particularly to small children.

Yes, Montana has a mosquito problem and controlling these pesky insects is big business. In the United States, over $55 million is spent annually to abate the mosquito. California spent over $13 million in 1974, while Montana expended over $400,000 last year, mostly on chemical poisons. But because of research, control methods are rapidly changing—and thankfully, improving. Today, the scientific community and the public demand a mixture of controls—the integrated control concept which is the only realistic answer to mosquito problems. This concept depends less on chemical poisons and more on safer methods such as biological control. (Biological control simply allows natural predators to prey on insect pests.)

Perhaps Meriwether Lewis and William Clark were the first to officially record Montana's mosquito problems. Their journals contain over 50 references to mosquitoes while in Montana.

Early trappers and homesteaders burned green wood in their fireplaces because the smoke kept the mosquitoes at bay. To protect livestock, they burned moldy hay in a corner of a field so livestock could bathe in the smoke to escape their tormentors.

Allergic reactions to mosquito bites are common. The eyes of the victim can swell shut, large lumps

may appear on the neck and head and the welts sometimes linger for weeks. Mosquito repellents may help, but a single bite can stimulate a reaction in an extremely allergic person. Allergy shots may temporarily build up a person's immunities, but, needless to say, medical bills can be depressing.

Humans aren't the mosquitoes' only target. Livestock, and to a lesser extent wildlife, are targets for the hungry female mosquito. The torment sometimes results in unusual behavior. For example, when massive mosquito populations threaten cattle in Louisiana, the cattle bunch up—forming a compact group on high, barren ground where they neither feed nor drink for several days. In Montana, cattle have been observed running about aimlessly, resulting in weight losses of as much as one-half pound per day or more. Milk production can be reduced by 36 pounds per cow for a week. Anaplasmosis (a frequently fatal blood disease of cattle transmitted by mosquitoes, horse flies and ticks) costs U.S. stockmen $100 million yearly. In many cases, mosquitoes have caused the weak and young domestic animals to suffer or die from loss of blood or suffocation by inhaling large numbers of mosquitoes.

Deer and elk often seek the cool and windy high country during mosquito season. Elk sometimes wallow in their favorite mud hole, covering their bodies with protective mud. While wildlife can usually find respite from the biting female mosquito, livestock usually can't. And the income farmers, ranchers and dairymen lose to the mosquito can only mean harder times.

IN MONTANA, two dread diseases, St. Louis encephalitis and western equine encephalitis, are both transmitted by the mosquito. The primary culprit is *Culex tarsalis,* more commonly known as the encephalitis mosquito. Both viruses are found in Montana, but western equine

encephalitis is more prevalent, inflicting 4 humans and 76 horses in 1975. However, many cases go unrecorded because symptoms may be mild, or laboratory confirmation is never obtained. When infants contract the virus, they more commonly experience neurological damage and display mental disorders requiring institutionalization. Death results in a small percentage of cases of western equine encephalitis and in about 25% of the cases of St. Louis encephalitis.

Montana today is a haven for the recreationist, but disaster can strike quickly and almost anywhere. Savage attacks by hordes of mosquitoes can turn back the poorly equipped fisherman out to enjoy Montana's river bottoms. Painful, itchy arms, legs and face are the price the sportsman pays for not dressing properly and not carrying insect repellent. Sometimes, even repellent doesn't turn back the relentless hordes.

Mosquitoes also manage to take a big bite out of Montana's tourism industry. A resort situated in northeastern Montana experienced such a tremendous hatch of mosquitoes in 1974 that its golf course was practically unused from the end of June through August. Also, because of mosquitoes, some 53 trailers left in one weekend. In these mosquito paradises, every summer outdoor activity and business is affected—from eating at an outdoor restaurant to jogging around the park. Obviously, people don't want to vacation in such spots.

The world has about 1,000,000,000,000,000,000 (1 million trillion) insects. If the average insect weighs 2.5 milligrams (less than 1/10,000th of an ounce), insects would weigh more than 12 times the earth's human population.

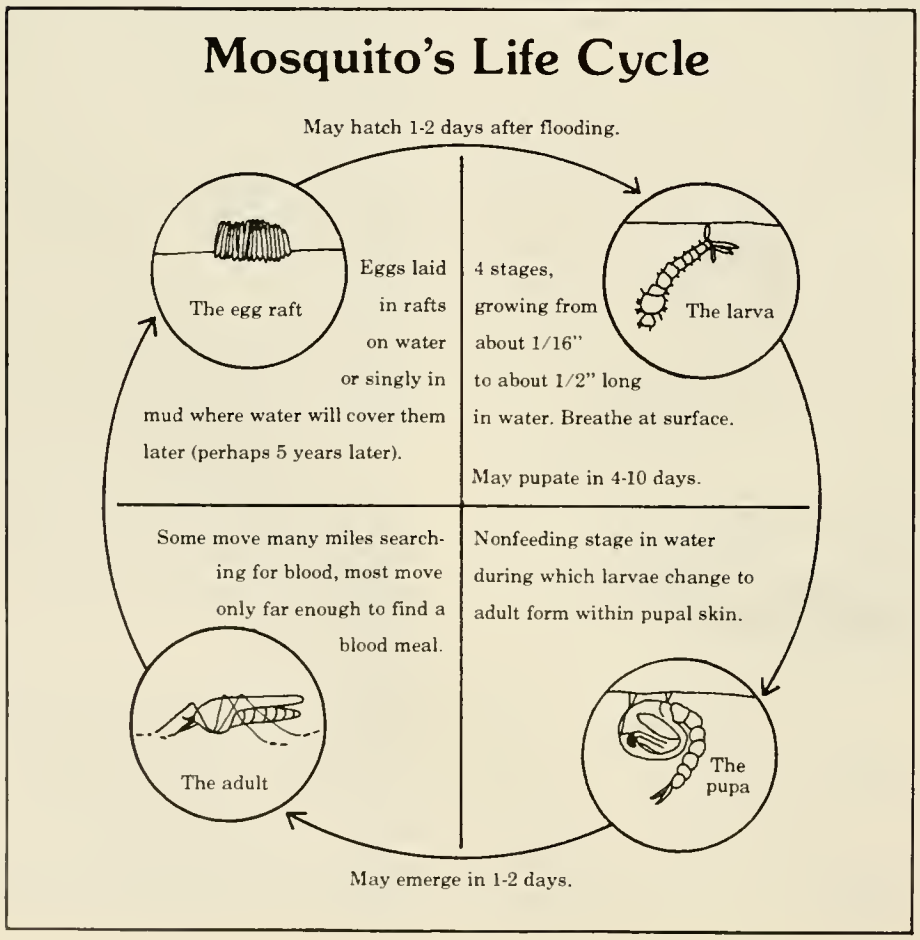
AFTER THE TURN of the century, the advent of insecticides provided a way to control insects and, in turn, sparked agricultural production to help feed hungry millions. Practically overnight, the entire world turned to insecticides as magical solutions. For nearly 30 years, success was universally welcomed and enjoyed. For example, DDT practically eliminated malaria, a deadly disease carried by mosquitoes, from many countries.

Almost anybody could develop and sell an insecticide, as long as it killed the insects it claimed it would. Few restrictions were placed on the manufacturer, distributor, retailer or user.

What exactly are insecticides? They are poisons, a diversified group of natural or synthetic chemicals, developed to kill, prevent or suppress a wide variety of insect pests. To meet current demands, more than 450 million pounds of insecticides is produced each year in the United States. Of the insecticides used to control mosquitoes, organophosphates and carbamates are used most frequently. Some of these poisons, such as malathion, parathion, Dursban and Baygon were originally developed as gas warfare agents. Other poisonous organophosphates include Baytex and Abate.

As disturbing evidence mounted, people realized insecticides were not all that magical. For example, children were accidentally poisoned from mislaid spray cans. Soils in California's Napa Valley were left nearly sterile from overapplication of insecticides. And populations of the bald eagle, the peregrine falcon, the brown pelican and other birds declined because insecticides accumulated in their food.

Thus, conservationists took insecticides to task. Major battles were won, and the Environmental Protection Agency (EPA) was formed to, among other things, regulate insecticide usage. Chemical companies were forced to conduct exhaustive experiments before registering insecticides. They also began to develop less poisonous mosquito controls, such as the growth


Mosquito's Life Cycle
May hatch 1-2 days after flooding.
The egg raft
Eggs laid in rafts on water or singly in mud where water will cover them later (perhaps 5 years later).
The larva
4 stages, growing from about 1/16" to about 1/2" long in water. Breathe at surface.
May pupate in 4-10 days.
The pupa
Nonfeeding stage in water during which larvae change to adult form within pupal skin.
The adult
Some move many miles searching for blood, most move only far enough to find a blood meal.
May emerge in 1-2 days.

regulators, Dimilin and Altosid. Scientists discovered that chlorinated hydrocarbons (DDT, chlorodane, endrin, dieldrin and toxaphene) persisted at poisonous levels in the food chain for 20 years or more, so usage was restricted or banned. Yet, insecticide poisoning still poses a serious health problem in many parts of the world.

Insecticides may also harm livestock, wildlife and beneficial organisms (like insects). Insecticides are disastrous to the aquatic environment, a delicate system teeming with thousands of organisms. Each organism—from a single-celled protozoan to a large fish—is a link in a food chain. Food chains can form a complex food web. This web resembles a pyramid in terms of mass or numbers of organisms and it is tiered into nutritional levels. Millions of microscopic organisms or producers fill the lower tier while relatively few of the larger consumers (for example, game fish) occupy the upper levels. A healthy game fish population depends on maintaining this ratio of numbers and, subsequently, food availability between the upper and lower tiers.

Insecticides are not "specific," meaning the poisons are not selective in which organisms they kill. Insecticide application can cause the entire pyramid to crumble. Along with mosquitoes (targets of the poison), small aquatic life such as protozoans or crustaceans (nontarget organisms) and other insects are eliminated. Mosquito breeding waters often receive from one to four insecticide treatments during the mosquito season, at intervals of two to three weeks. Fish and waterfowl will also die if directly exposed to excessive amounts.

Also, disrupting the food chain can have a mushrooming effect. Larger consumers such as game fish, near the top of the pyramid and often not directly affected by the insecticide, find the bottom has fallen out of the pyramid. Their food source, the smaller organisms, has perished and survival of the larger organisms becomes doubtful.

In summer 1955, a large forest area along the Yellowstone River was sprayed with DDT to control spruce budworm. About 99% of the aquatic invertebrates (fish food) along the 100-mile stretch of river died. Trout, whitefish and suckers began to die in early October and November. Many fish probably starved because most of the aquatic invertebrates had been killed by the spray. Another probable cause of death was absorption and accumulation of DDT in the fish's fat deposits, acquired when the fish fed on DDT-killed insects.

When Baytex, commonly used for mosquito control, is applied at the prescribed rate in a wetland area, it kills some species of shore and wading birds. These birds are attracted to a sprayed area to feed on dying insects which are contaminated. They feed so voraciously that their nervous systems are affected and death results. Man—the predator at the end of the food chain and the one who manipulates the environment—is knowingly or unknowingly endangering himself.

Plus, some mosquitoes have developed a resistance to insecticides. In California, many mosquito species, like the encephalitis mosquito, are resistant to malathion which prompts applicators to use larger dosages or a greater variety of insecticides to obtain previous levels of control. So, it costs more to control mosquitoes—costs which the taxpayer must absorb in the case of organized abatement districts, or for private land, the landowner must pay for himself. It is conceivable mosquitoes in Montana could develop a similar resistance to insecticides.

Chemical insecticides have some definite drawbacks, but it would be foolish to completely discontinue their use at this time. The insecticide controversy must be kept in proper perspective, because insecticides are valuable in increasing food supplies and preventing disease.

TO CONTROL the pesky critters, one must first know the mosquito. Montana harbors 44 species of mosquitoes. They breed in marshes, sloughs, irriga-

tion ditches, fish ponds, borrow pits filled by irrigation run-off and old river channels and oxbows where water is slow or stagnant and shallow. In some areas of Montana, 90% of the mosquito problem is related to field irrigation. Although this fact has been documented for 20 or 30 years, most efforts to improve irrigation practices have met with little success.

Mosquitoes lay eggs singly or in groups on the water or singly on the ground above receding water lines. Some mosquitoes prefer tree holes, old tires, cow tracks or tin cans. Depending on the species, they may lay eggs more than once per season. The hardy eggs can withstand five years of drying and freezing, but require water to hatch into "wigglers" (the larval stage, so called because of their motion in water). Whenever Montana has heavy winter snows and a rainy spring with higher than normal run-off and flooding, the mosquito problem magnifies because eggs left above the water line from previous high waters are flooded.

Larvae pass through four stages, shedding their exoskeleton ("coat") after each to grow into a new and larger "coat" until the final (pupal) stage. The mosquito takes form beneath the pupal sheath or skin, which stays on from one day to a few weeks. When the pupal sheath breaks, the adult works its way out, crawls onto the surface of the water and is soon ready to fly. When water temperature reaches 50°F., hatching and larval growth begin.

Mosquitoes usually don't fly further than five miles from the hatch site. Males normally stay near the breeding site and mate with the female soon after she emerges. Then the aggressive female begins her search for a victim to bite since most species require blood to lay fertile eggs. After biting her victim, the female needs two days to digest the blood before laying eggs. She may feed four or five times during her lifetime.

Natural mortality from pathogens (viruses, bacteria, fungi, protozoans), insects and fish take a heavy toll on mosquitoes during the larval and pupal stages. Of those that manage to emerge from the pupal sheath, natural predators will kill 20% within 24 hours. Within 10 days, 90% of a hatch will die, although some individuals have survived one or two months under ideal summer conditions. Some adult mosquitoes hatched in late fall hibernate in cracks of buildings and other protective covers and thus survive the winter.

THERE IS A SAFE WAY to control those mosquitoes which do survive—biological control agents. They do not cause environmental degradation; they generally attack only the target organism or pest and are economically competitive with insecticides. In California, 8% of mosquito abatement programs are devoted to biological agents and they cost about the same as or less than chemical insecticides.

As with any control, care must be taken before introducing a biological control agent into an ecosystem where the control agent could possibly become the pest. When evaluating biological control agents, their impact on beneficial insects—competition, displacement and safety—and health-related problems must be considered. Biological control agents *can* proliferate. For example, carp were originally introduced for food but have subsequently degraded the environment with their sheer numbers. Remember the environmental insults that resulted from introduction of exotic species like the English sparrow, European starling, African honey "killer" bee, fire ants and more recently, the walking catfish from southeast Asia.

Over the years, some biological agents have proved effective and others haven't. Probably the most noteworthy example of the latter was the purple martin, a bird with a reputation for eating mosquitoes. But, researchers later found it flies during daylight, not during early morning and late evening when mosquitoes are out in force. And, after dissecting several hundred of these birds, they failed to find adult mosquitoes in the digestive tracts.

Over 900 predators, insects, parasites and pathogens have served as biological controls for insects, many controlling mosquitoes. For example, both adult and larval dragonflies consume mosquito larvae. However, dragonflies have not been used extensively because immature dragonflies don't have enough tenacity when it comes to "hunting down" mosquitoes, mass production techniques for dragonflies have never been adequately developed and it's difficult to have dragonflies around when mosquitoes are present.

The backswimmer, an aquatic insect, feeds on mosquito larvae. However, many backswimmers would be required to control mosquito larvae and mass-rearing techniques have not yet been perfected—although researchers are working on the problem. Remember, any insect preying on mosquito larvae to any degree contributes to natural control.

The most widely used biological control agents are mosquito-eating fish (larvivores), with the mosquitofish *(Gambusia affinis)* topping the list. The mosquitofish is commonly referred to as the universal larvivore and is the most widely distributed natural predator in the history of biological mosquito control. Already, this fish has been used for mosquito control in most countries of the world. In fact, Dr. E. C. Bay, renowned for his work with mosquitofish, notes, "It is not likely that a better, all-around fish than *Gambusia* is apt to be found for mosquito control." Mosquitofish also have a positive psychological impact on the public because they don't have the adverse side effects of insecticides.

This fish was introduced several years ago into several warm water ponds west of Drummond, Mont., perhaps by a tropical fish enthusiast. Females reach sexual maturity within six

weeks and give birth to several broods, averaging 45 young (called "fries"), from May through October. One temporary pond planted by the author with over 800 fish in March 1976 near Townsend, Mont. yielded several hundred thousand fish by September. The fish adapts well to most mosquito-producing areas and doesn't seem to degrade the aquatic environment any more than other Montana fishes. Another plus is that mosquitofish don't seem to displace sport fishes in northern climates and may themselves become part of the food chain for larger fishes.

During 1976, over 22,000 mosquitofish were planted experimentally in Montana for mosquito control. Permanent rearing and wintering sites were established so later plants would be possible. A physiological characteristic of mosquitofish has, in turn, made them "controllable" in Montana; they can't tolerate water much colder than 40°F.

When water temperatures approach 50°F. in spring, mosquitofish (300 per acre) are planted into permanent or temporary mosquito breeding waters. Within about two weeks, the mosquito larvae population is usually controlled and will remain under control for the rest of the mosquito season. (Generally, one planting of mosquitofish compensates for two to four applications of insecticide.) When winter comes and the water freezes or dries up, mosquitofish perish. Only in a few isolated cases have they survived under ice, and not for a prolonged period.

Officials in Cascade County, Mont. for the past six years have released nearly 4,500 mosquitofish each year. They are wintered in indoor holding tanks.

Last year, mosquitofish were planted into a warm water sewage lagoon at Alhambra, Mont., south of Helena. They flourished, even though nutrients from the sewage treatment caused the dissolved oxygen in the pond to fluctuate above and below the saturation level. Even with adverse dissolved oxygen conditions that may kill other fish, mosquitofish thrive.

An enclosed recycling pond that cools the American Smelting and Refining Co. (ASARCO) plant in East Helena, Mont. is contaminated with cadmium, zinc and copper at concentrations intolerable for trout, with water temperatures higher than 96°F. Yet, mosquitofish planted there flourish. In fact, numerous young fries were born in February of this year, three months earlier than normal.

The Broadwater County Mosquito Abatement District, delighted with the mosquitofish's success, constructed a small holding pond on a warm water creek in which to winter the fish and will have a substantial number to plant in spring. (For more information on mosquitofish, contact the Vector Control Section, Dept. of Health and Environmental Sciences; Helena, MT 59601.)

However, mosquitofish aren't the only Montana fish which eat mosquito larvae. The fathead minnow, a forage fish, is another. It inhabits many Montana drainages east of the Continental Divide. A study has been proposed to determine how well Montana fishes such as the fathead minnow would work for mosquito control. Careful use of Montana species will minimize the possibility of environmental degradation and probably reduce the mosquito problem in the state by as much as 30%. This approach should be especially welcome in sparsely populated areas where mosquito abatement efforts have been meager in the past.

Most of California's biological control efforts to eradicate mos-

quitoes have focused on the mosquitofish. Abatement districts rear and plant the mosquitofish inexpensively, yielding a substantial savings over insecticides. Some mosquito abatement managers claim to be able to control an acre of mosquito-producing waters for less than a dollar, while it generally costs anywhere from $8-$50 to control an acre with insecticides. El Paso County in Colorado totally depends on mosquitofish for control and claims a 50%-60% savings each year over insecticide cost.

FOR THE PAST 50 YEARS, biologists have known that hydras prey on early stages of mosquito larvae. Hydras (small, fresh water animals, with a tubelike body and a mouth surrounded by tentacles) possess the credentials of a good natural control agent: (1) They can be produced by the million in a semidormant state; (2) they are easily stored and disseminated, and (3) they reproduce in the environment into which they are introduced and kill organisms larger than themselves. Hydras inhabit dense, weedy, shallow areas unsuitable for mosquito-eating fishes. Researchers in Minnesota are studying the green hydra—one of the most common forms—for mosquito control.

In the presence of light, blue-green algae produce a substance poisonous to mosquito larvae. But the role algae will play in mosquito control is questionable. Blue-green algae grow only in certain aquatic habitats, not necessarily where mosquitoes are produced. One drawback is they may be toxic to mammals.

Newly hatched roundworms (nematodes) of a certain species attack early stages of mosquito larvae. They puncture the larvae's skin, crawl inside and coil around the larvae. (This roundworm is a parasite and it grows on the nutrients supplied by the mosquito host.) The mature roundworm bites a hole in the mosquito larva and the emaciated larva bleeds to death. Then the roundworm emerges and drops to the bottom of the pond to mate. The roundworm preys on 63 species of mosquitoes and some black flies. Its ability to kill mosquito larvae is good, and the ability to perpetuate itself from year to year in certain aquatic habitats is remarkable. Roundworm eggs come packed in moist sand and are available commercially. Tossing the sand into water or inundating the sand with distilled water for 8-12 hours causes the eggs to hatch. Then, the water and microscopic roundworms (1/20th of an inch long) are drawn off and distributed with spray equipment. Researchers don't know how well the roundworm will work and adapt to Montana's harsh environment. The species was first identified in Wyoming and it's possible it might even be native to Montana. (For more information on this commercially available biological agent, contact: Skeeter Doom [brand name], Fairfax Biological Laboratory, Inc.; Clinton Corners, NY 12514.)

Maine biologists are testing a flatworm—a planaria—as a biological control agent. It may be able to adapt to Montana's cold climate. This voracious flatworm devours mosquito larvae or secretes a glue-like substance which temporarily immobilizes its victim for a later meal.

In California, another planaria has shown promise. First, it immobilizes the mosquito larva. Then, it inserts a feeding tube and sucks out the mosquito's contents. If a local strain of this planaria could be located, the chance of survival would be much greater. In suitable aquatic habitats, these flatworms perpetuate themselves and control mosquitoes year after year.

Pathogens (as mentioned earlier, viruses, bacteria, fungi, protozoans) have entered the spotlight and might be tomorrow's natural controls. Bacteria perhaps have the greatest potential. In the United States, several million pounds of a strain of *Bacillus thuringiensis* (BT) is sold annually to control leaf-chewing insects such as cabbage loopers on lettuce and other pests on tobacco and cotton. For mosquito control, biologists are field testing a strain of *Bacillus sphaericus*. The insecticidal activity of this strain causes destruction of the larvae's digestive tissue. Fungal agents will probably be ready for mosquito abatement within six to ten years. Several have demonstrated good control of mosquito larvae in field trials, although more testing and refinement of mass production techniques are warranted. During the next decade, protozoans and particularly viruses will also play an integral part of mosquito eradication.

Montana's 44th Legislature recognized the importance of biological controls and the fact that hardly any work on their potential was being conducted in the state. The legislature appropriated funds for a feasibility study which not only examined the merit of such agents, but also helped to integrate them into organized mosquito control programs. Yet, Montana is still years behind other western states. As new biological agents become commercially available, this study will evaluate their efficacy, adaptability and environmental soundness in Montana. Mosquito eradication programs, in turn, will utilize the most promising agents.

A natural control program depends on Montanans uniting and trumpeting their unanimous support for these controls. If Montanans develop a complacent attitude toward the use of natural controls, it won't take long before the environment is measurably degraded and cherished aesthetics damaged.

The environment assures survival of all members of nature's community, including man. But the environment could be degraded beyond recognition by man's use of chemical poisons in an effort to meet food and health demands of an ever-growing world population. Man and the environment must work harmoniously with one another, or every member of nature's family will suffer irreversible consequences—with man holding the reins of destiny. ■

# The Catchall

## It Was a Bad Winter for the Coyote

One of the most interesting chapters in the state's long fur trading history ended about the first week in March when Montana's unofficial "coyote season" closed.

This year's coyote harvest, unlike Montana's other crops, went for all-time record prices. In the October 1976 issue of *Mademoiselle,* a fashion magazine, a model is pictured wearing a knee-length coyote coat. The caption reads ". . . natural Montana coyote . . . $2,850 . . . ." The last page of the 1976 Eddie Bauer Christmas catalog advertises his and her coyote parkas for $1,500 each. On the same page, a pair of muskrat coats is shown. The garment with a muskrat collar retails for $650 and the same coat with a coyote collar, $1,200. These are three examples of why the price of coyote pelts has escalated.

Fur in general, and long fur in particular, is fashionable. A Canadian wildlife biologist told The Wildlife Society in Kalispell that a single coyote hide was traded privately in Edmonton for $240 in February. On Feb. 8, the huge Edmonton Fur Auction recorded a top price of $212, with a number of Montana hides going in the $200 range. The sale report shows 22,250 coyote hides offered and 125 foreign and domestic buyers in attendance. The Seattle Fur Exchange, in its Feb. 15 report, listed a top of $148 and an average of $123.62 for "Montana type" coyotes. Other record prices were also set at the Dominion/Soudack Fur Auction in Winnipeg and the Saskatchewan Fur Marketing Service in Regina.

The record prices—the ones most people talk about—are received for the relatively few select, large, light colored, soft textured pelts known as "pales" and "silks." The average pelt goes for much less, but the price is high nonetheless. This year, Beckman's in Great Falls, one of Montana's top fur buyers, paid between $25 and $145 for coyotes. Pacific Hide & Fur Depot, another big buyer, paid $80 to $90 apiece for quality pelts at some of its depots. In Glasgow, five untreated carcasses were sold for $67.50 each. The average price ranged from $45-$65.

In a photo feature in the Jan. 31, 1977 Great Falls Tribune, Beckman's furrier Lui Salina estimated the past season's harvest at 35,000 coyotes. Some think Salina's figure is slightly high, estimating the true harvest at between 30,000 and 36,000. Total value of this crop to the buyer who uses the pelts is between $2.5 million and $3 million. In Glasgow, Lee Smelser, local Pacific Hide & Fur Depot owner and manager, figures he paid about $350,000 for fur this year, a good part of it for about 2,800 coyotes. He estimates his brother, Bill, who manages the Pacific Hide & Fur Depot in Sidney, spent close to $500,000 and handled about 4,000 coyotes, about one-third of which came from North Dakota. That kind of money circulating two or three times in relatively small rural communities has a tremendous impact on the local economy.

Checking back in old Dept. of Fish and Game files, the 1950-51 recorded fur harvest estimate for coyotes was 147, and they sold for $1.28 each. In the 1963-64 season, 287 coyotes were taken and brought $3.65 apiece. In the winter of 1967-68, the local price for coyotes dropped to $3.45 each. The recorded coyote take from 1970-74 jumped to an average of 3,778 per year.

High prices have stimulated interest in all forms of fur taking. The number of general and landowner trapping licenses sold in Montana this past fiscal year (but only through Jan. 31, 1977) was 2,058—or 709 more than were sold in all of 1975-76 and 1,493 more than were sold in 1970. Since trapping licenses are not required to take coyotes, it can only be surmised that interest in them has increased similarly.

Resident and nonresident fur dealer and fur dealer agent licenses increased from 96 last year to 122 this year. The number of licensed aerial gunners accounted for about 950 coyotes; this year the kill is anticipated at around 3,500. One gunner from Havre allegedly has taken about

*Gov. Thomas L. Judge has signed into law a bill declaring the blackspotted or westslope cutthroat Montana's state fish. This was the public's choice, as shown by a poll conducted by Norma Ashby of the Montana Television Network's morning program, "Today in Montana." Sen. Margaret Warden (D-Great Falls) and Rep. George Johnston (D-Cut Bank) successfully carried the bill in the 1977 Montana Legislature. From left, the photo shows Mrs. Ashby, Rep. Johnston, Gov. Judge and Sen. Warden. (F&G photo: Vern Craig)*



recycled paper

430 coyotes.

This new interest in coyotes has created a few problems. A fish and game plane flying deer counts near Scobey in early February was harassed by two planes and followed by a third. The three pilots later told department employes they thought the state plane was after coyotes and was "invading their territory."

Access to some land for aerial control of coyotes has been restricted because of the action of a few gunners and also because some landowners now prefer to take their own coyotes to help pay their bills.

State Sen. Ed Smith (R-Dagmar) introduced SB 342 into the 1977 session which would have authorized a high ($225) nonresident coyote-fox trapper's license. The bill was introduced for constituents who felt the state's long fur resource should be protected for Montanans. It seems that at least five nonresident trapping outfits from Iowa, Minnesota, Ohio and Wisconsin took about 400 fox and quite a few coyotes from northeastern Montana. The bill was later killed in the Montana Legislature, but a similar bill was passed by North Dakota lawmakers.

SB 281, introduced by state Sen. Mark Etchart (R-Glasgow) and others is an attempt to control use of snare traps. Such traps are popular for taking coyotes. But they can also cripple livestock and several stockmen have complained about them. At this writing, the bill was passed by the House and Senate and will probably be signed into law by the governor.

Federal and state predator control programs run year round. In Montana, the U.S. Fish and Wildlife Service, through its Division of Wildlife Services, took 1,790 coyotes between October 1976 and the end of February 1977—648 by helicopter, 610 by fixed wing aircraft and 532 on the ground. Nearly all of these coyotes were taken in response to predation complaints.

The Montana Dept. of Livestock runs two helicopters. Its coyote take for the last half of 1976 was 1,137 coyotes in 721 hours of flying. In addition, the Dept. of Livestock has trained 275 persons in use of the M-44 "coyote getter." About 150 of these trainees have applied for a license this year.

Without doubt, the winter of 1976-77 was good for trappers and those advocating more predator control, but bad for Montana's "song dog," the coyote.—*Mike Aderhold*

*F&G photo: Bill Schneider*

# Caution—Deer Crossing

Man is constantly changing the environment to satisfy his own requirements. Each time a natural environment is disturbed, conflicts with wildlife arise.

Construction of highways through deer habitat is no exception. Many miles of Montana highways bisect major deer concentration areas. With traffic increasing on these highways, safe driving must be emphasized for protection of both deer and motorist.

To provide a better understanding of accidents involving deer, let's begin by looking at deer-auto collisions and three main aspects of the problem: (1) how to identify the most hazardous locations and conditions, (2) how to drive to avoid collisions with deer and (3) what to do if you're involved in a deer-auto accident.

Statistics on deer-auto collisions compiled by the Montana Dept. of Highways can help evaluate collision possibilities. Factors to consider include terrain, the month, day of the week and time of day you select to travel.

First, areas where deer-auto accidents are most likely to occur must be identified. Sixty per cent of these accidents occur in the western half of Montana. Highways in this area frequently pass through the type of deer habitat conducive to deer-auto conflicts—wooded areas which provide cover on one side of the road with range or crop lands which provide food on the other.

Another potential accident situation exists where thick stands of timber border the road. Under these conditions, the driver's vision and reaction time are limited. In many instances, deer will suddenly appear on the highway before evasive action can be taken. Highways passing through mountainous regions create special hazards. Fences, guard rails, rugged terrain and snowbanks confine the deer to the traveled portion of the road area.

Early spring brings yet another problem for deer and motorist. Heat generated from the sun on highway asphalt causes vegetation near the highway to turn green before forage in the usual grazing areas. Large numbers of deer seeking this early green vegetation are drawn to the roadside and create a dangerous driving situation.

Dept. of Highways statistics indicate most deer-auto accidents occur in September and October (both 13%), followed by November (12%), August (11%) and July (10%). January and February are the months with the fewest deer-related accidents. However, individual areas can differ significantly from statewide averages.

Sunday is the day most (19%) deer-auto accidents occur in Montana, followed by Saturday (18%) and Fri-

day (16%), perhaps because of heavier weekend traffic. Fewest accidents occur on Monday. Evening hours between 7 p.m. and midnight are the most hazardous, with 44% of the accidents happening then. This is also the time when deer movements peak.

How can the motorist avoid collisions with deer? Be alert and cautious when driving in areas where deer are likely to be on the road. Observe the "Caution—Deer Crossing" signs which are placed in areas where deer habitually cross the road. Become familiar with the time periods when deer are most likely to frequent your travel route. Be especially careful between the critical hours of 7 p.m. and midnight. Always concentrate on deer detection and be prepared to stop within the range of your headlights.

If you see a deer on the highway, observing a few simple rules may avoid an accident. First, slow down. If it's dark, dim your lights so you don't blind the deer. Give the deer time to select its escape route. Don't sound your horn or approach too rapidly. This may cause the deer to panic and it could injure itself or turn and run into the car. Finally, after the deer is safely out of your path, do not assume it was alone. More often than not, several deer will be crossing in a given area, and while your attention is directed toward one, you may fail to see the others.

If all evasive efforts fail and you hit a deer, what should you do? If your vehicle is damaged or someone is injured, immediately notify the Highway Patrol or nearest local law enforcement agency. The investigating officer will usually notify the local fish and game warden who will take appropriate action concerning the deer.

If damage is slight and an investigation is not required, the motorist should notify the Dept. of Fish and Game so the deer can be removed from the highway, or properly disposed of if it is still alive. If possible, move the deer from the driving lane but leave it at the scene of the accident. Under no circumstances should you pick up the carcass or transport it to another location. This is a violation of Montana law.

"What do you do with a road-killed deer?" is a question frequently asked. The meat can sometimes be salvaged. If so, the carcass is sold at public auction or donated to charitable institutions. More often, the impact of the vehicle leaves the meat inedible. However, parts of the deer still have value to research biologists. Department game biologists are studying reproductive tracts of female road-killed deer. Lower jaws are also collected to determine the deer's age.

Secondary fatalities to wildlife often occur when dead deer are left along highways. Eagles and other scavengers congregate to feed on the carcasses. This not only presents a hazard to traffic, but frequently results in the death of the scavenger.

Alert, careful driving in deer country will help prevent the waste of a valuable resource, the potential loss of human life and property and will benefit all who appreciate Montana's wildlife.—*Earle D. Davis*

# Boating Safety Laws

Water safety regulations are nothing new to Montana boaters. Back in the late 1800s, agents for Great Northern Railroad terminated use of a 400-ton barge carrying supplies and passengers up Flathead Lake because the vessel had insufficient life preservers on board.

As boating became a popular sport in Montana, the public demanded safety regulations. By 1957, boaters had to carry life saving equipment on board or face a $10 fine. In 1958, Congress passed the Federal Boat Act. In 1959, the Montana Legislature passed the State Boating Policy and Montana became the first state to enact a major boating law.

Under the new legislation, boats had to be equipped with flame arresters, sounding devices and fire extinguishers and could not be overpowered or overloaded. Water skiing regulations were included in the law. All motorboats over 10 horsepower were supposed to be registered, but of an estimated 19,000 boats, only 6,771 were registered in 1959. In 1960, the Dept. of Fish and Game began registering boats. (In 1963, the duty was transferred to the Dept. of Revenue, and in 1973, to the Registrar of Motor Vehicles.)

Officials responsible for administration and enforcement of state boating laws met in Washington, D.C. in 1960. This meeting resulted in formation of the National Assn. of Boating Law Administrators, a group working for safe boating through safe equipment, education and uniform laws and enforcement.

Boating popularity was growing rapidly and trailerable boats were moving throughout the United States. But no standard laws governed boating. For example, in 1961, Montana law required an approved life saving device for each person aboard each vessel, while other states had different restrictions. Federal law required life preservers only on vessels propelled by machinery.

It was clear that a uniform boat act, with assistance funds to the states, was needed. In Montana, statutes provided for safe boating practices, enforcement and penalties, but there were no funds to implement the boating safety program, so it had low priority.

In 1971, the Federal Boat Safety Act

was enacted. It improved boating safety programs throughout the nation and encouraged states, the boating industry and the public to develop more comprehensive and uniform safety standards and programs.

Under the law, federal funds are alloted to participating states—1/3 divided equally among the states, 1/3 based on the number of registered vessels and 1/3 based on the previous year's expenditures in the boating program. These funds must be matched by state funds on a 50:50 ratio. Montana's share comes from the $1 boat license decal fee, boating violation fines and from other department monies. (No fees paid as property taxes on vessels are received by the department.)

Over 27,000 vessels were registered in Montana in 1976. The sport continues to grow with sailing, family ski boats, jet boats and an array of aquatic devices. With these new types of vessels and devices, additional regulations to protect the public from dangerous equipment, devices and operators will no doubt be forthcoming. —*Don Malmberg*

## "A Look at Nature"

"A Look at Nature" is a series of 10-minute educational films especially produced for a grade school audience by the Dept. of Fish and Game Film Center.

The first two films in the series are now ready for distribution and are available from the Dept. of Fish and Game Film Center, 930 Custer Ave. W. in Helena. "Deer Song" is a film about deer and their life style in Montana, and "Bighorn" presents details about Montana's bighorn sheep.

The films are available free to schools, church groups or other youth organizations.

## Missouri Shows the Way

Last fall, Missouri conservationists campaigned to place a unique initiative on the state's general election ballot. The initiative, dubbed Conservation Amendment 1, called for an increase in state sales tax and earmarked that additional money to fund conservation programs. (See "New Way to Fund Conservation," The Catchall, *Montana Outdoors*, Sept./Oct. 1976.)

The drive to place Conservation Amendment 1 on the ballot was successful and, in November, the voters of Missouri passed this landmark legislation. With their votes, Missourians (1) secured funding for a broad array of conservation programs and (2) spread costs of administering such programs among all citizens of the state.

According to Carl R. Noren, director of the Missouri Dept. of Conservation, money from the one-eighth of one per cent sales tax increase will be used to acquire new wildlife habitat and recreation areas, to improve wildlife research and management and to "give new and needed attention" to nongame wildlife. Noren adds that Missouri's new conservation program "will give equal emphasis to all aspects of the outdoors," because it is supported by all Missourians.

In Missouri, as in almost every other state, hunters and fishermen had been the sole source of funding for wildlife and conservation programs. Now, Missouri voters have insured that costs—as well as benefits—of such programs will be shared by all.—*Hugh Zackheim*

# Book Reviews

**WESTERN COOKING**, by Lois McBride, David McKay Co., Inc., New York, 1976, 272 pages, $10.95

Filled with fantasy, but practical; down to earth, but creative—it sounds as if those are contradictory words. They're not, because Lois McBride's "Western Cooking" is much more than cups of this and teaspoons of that.

She has written a cookbook that you can curl up with in front of the fireplace. It will take only an afternoon to read, but I guarantee you'll be tempted from your fireplace spot by some of the delectable dishes she offers.

The recipes are the kind that make sense—if you don't have cream, use evaporated milk mixed with a little water. If you lack the scraped carrot called for, some diced apple will do. If you don't have macaroni, break up some pieces of spaghetti. Many of her hints make you wonder why you never thought of them yourself.

On the book's jacket, it says that McBride confesses she has gained a reputation as a good cook in spite of the fact she doesn't spend all of her time in the kitchen. Instead, she believes that love for family and friends can best be expressed through good, hearty food that can be prepared easily and without spending a lot of money.

The anecdotes which accompany most of the recipes provide delightful reading. For example, her recipe for "Mexican Soup" includes the following reminiscence: "The desert is a secretive world, hiding springs in willowed gullies and abandoned mines on the slopes of mountains. There was such a mine on such a mountain, where my husband, Tom, [an outdoor and wildlife photographer] and I feasted on boiled coffee, "Mexican Soup" and cold biscuits; watched twilight come, and remembered the struggle of people we had never known."

She devotes an entire section to camp menus, backpack and trail foods. McBride suggests you can save money and have a better product by making some of your own foods and packaging them yourself in plastic bags instead of buying expensive, prepared trail foods. The recipes include one for a homemade trail breakfast (resembling commercial granola), freighters (who cares if you eat a few too many because they're so good for you), space sticks, pemmican, glop and several others.

The section on "Fish—the No Waste Way to Start a Meal" provides some new, appealing ideas for old favorites. "Fish Piquant," zesty but elegant, utilizes nearly any kind of fillet brought home in the fisherman's creel, including salmon or whitefish. "Flathead Fish" combines fillets with tomatoes, onions, cheese and mushrooms for a tempting treat. The section also features several suggestions for perky sauces.

Other sections in the book include: "Hearty Soups and Soups as a Main Course," "Frontier Ways to Stretch Meat," "Ham Can be a Good Investment," "Chicken—Everybody's Favorite Way to Make a Food Budget Work," "Beans Instead of Meat," "Potatoes and Other Fillers," "Salads and Vegetables—When Fresh Food is Hard to Come By," "The Sweet Tooth Way to Leave the Table Feeling Full," "Homemade Bread for Pennies a Loaf" and "Entertaining Doesn't Have to Break the Bank—Backyard Barbecues and Picnics."

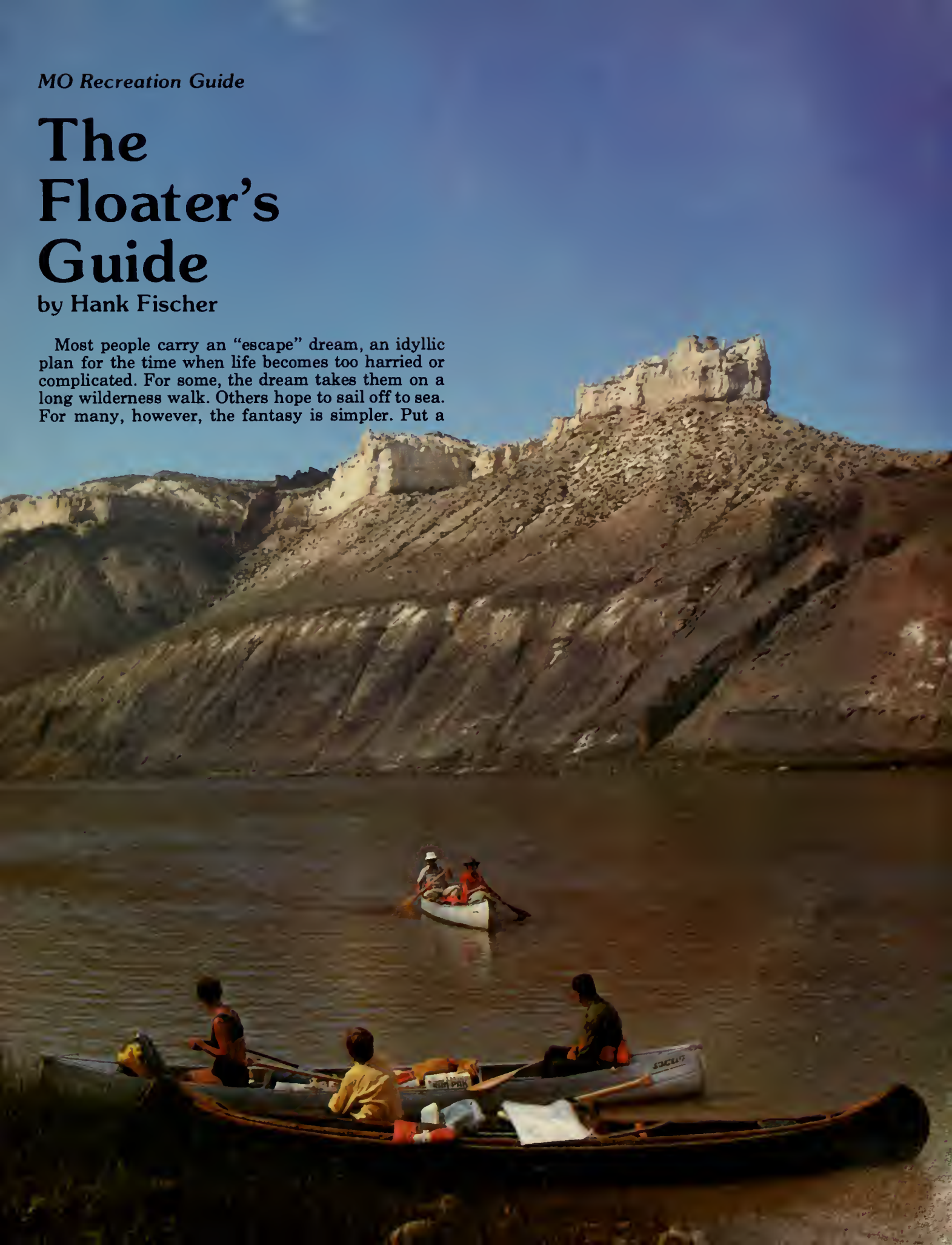
All that—plus, McBride's book is one heck of a piece of writing.—*Kay Ellerhoff*

*MO Recreation Guide*

# The Floater's Guide

by Hank Fischer

Most people carry an "escape" dream, an idyllic plan for the time when life becomes too harried or complicated. For some, the dream takes them on a long wilderness walk. Others hope to sail off to sea. For many, however, the fantasy is simpler. Put a



canoe or raft in the nearest river, lie back, let the sun warm the body, trail a hand in the water and float away.

Floating rivers has special significance in Montana because the waterways played an important part in the state's early history. The routes of Lewis and Clark and other explorers and fur traders have now become some of Montana's favored float trips. The Treasure State comprises thousands of miles of floatable rivers, ranging from fast moving wilderness streams to easily accessible waterways suitable for family outings. Pristine streams like the three forks of the Flathead, blue ribbon fishing waters like the Madison and historic rivers like the Missouri all beckon floating enthusiasts.

The reasons for floating are as varied as the people who do it. Many would-be Huck Finns find that floating takes them back to childhood days and the promise of adventure around the next bend. White water enthusiasts enjoy the thrill of maneuvering a craft through tricky rapids, pitting their skills against the speed and strength of the river. Others relish the peacefulness the river offers and discover the mesmerizing quality of clear, running water as it gurgles by cloud-scraping mountains or quiet prairies.

Aesthetics aside, floating provides a practical means for combining several recreational activities. Swimming, fishing, hunting, camping and bird watching mingle well on a river trip. In addition, floating offers a good opportunity for family outdoor recreation. At the same time, paddling provides good exercise for those not content with just drifting.

Good fishermen know floating produces exceptional catches. Not only can anglers try rarely fished spots, but they can also cover more stream. While some anglers fish while drifting, most prefer to get out of their crafts to work good holes.

Hunters also do well by cruising the rivers, particularly when seeking waterfowl. Take special precautions, however, because cold temperatures usually accompany the hunting season. Likewise, deer hunters often float brushy rivers or streams with large islands. Also, be sure to check the hunting regulations and ask permission before hunting on private land.

One of the major rewards of floating is the opportunity to observe wildlife from relatively close range. Not only does a raft or canoe allow a quiet approach, but floaters don't seem to alarm wildlife as fast as a human on foot does. Common sightings include white-tailed deer, ospreys, ducks and geese, bald and golden eagles, great blue herons, mink, beavers, raccoons and muskrats. Elk, bighorn sheep, grizzly and black bears, turkey vultures, river otters, trumpeter swans and many others can be seen on certain rivers.

Such wildlife sightings are often the highlight of a float trip—watching an osprey catch a fish, floating through a great blue heron rookery or seeing a deer with a newborn fawn. Such sights lure floaters back to the river at every opportunity.

Just as cross-country skiing is replacing snowmobiling and downhill skiing on the winter sports scene in some areas, floating rivers promises to partially replace water skiing and motorboating. Reasons for the switch are similar—a preference for scenery, solitude and silence. When a person floats a river, he becomes part of the natural scene rather than a noisy intruder. To this, add the low cost of river floating and the opportunity for good exercise, and it's obvious why floating has become so popular.

Floating's greatest virtue, however, is how lightly it touches the landscape. If floaters don't litter or otherwise leave unsightly signs of their passing, it's impact-free recreation. Rivers can be floated again and again without showing any signs of use. Or as one purist said, "It has to be the ideal form of recreation—it doesn't even leave tracks."

## Getting Started

Like many outdoor activities, the hardest part is learning basics. While books and guides provide an introduction, most people like to try an activity before investing in equipment. Fortunately, potential floaters can test their sport in several ways without spending much money.

Universities, city recreation departments,

## Suggested Reading

Several noteworthy books have been written on canoeing. Robert McNair's "Basic River Canoeing" has been recommended by many experts. It's available for $3.35 by writing to the American Camping Assn., Bradford Woods; Martinsville, IN 46151. Most libraries also carry it. Another top-notch book is "The Complete Wilderness Paddler" by James Davidson and John Rugge. It combines entertaining reading and authoritative advice for both beginners and experts.

*Canoe* is the bimonthly publication of the American Canoe Assn. It costs $6 per year and is published by the Webb Co., 1999 Shepard Road; St. Paul, MN 55116. *American Whitewater* provides glimpses of personal floating experiences—a where-to-go, what-to-do, how-to-do-it approach. Published bimonthly, it costs $5 per year and can be ordered from P.O. Box 51; Wallingford, CT 06492. Mostly for white water enthusiasts, *Down River* is published nine times per year by World Publications, 1400 Stierlin Road, Building C; Mountain View, CA 94043. Subscriptions cost $8. *Wilderness Camping* is a bimonthly magazine which usually devotes some space to canoeing. Subscriptions cost $6.50 per year and are available by writing 1597 Union Street; Schnectady, NY 12309.

*Preceding page, the wild Missouri. F&G photo: Dick Ellis*

YMCA's, Chambers of Commerce, etc. periodically sponsor float trips. Such outings usually provide a safe introduction and are a good way to meet other floaters.

Having an experienced floater for a friend is probably the best way to get started. But if none of your friends knows the rudiments of floating, try an outfitter who conducts float trips. Several float businesses have organized in the past few years, and they typically offer safe trips conducted by experts.

Renting a canoe or raft is also an option. Some rental stores and most canoe dealers rent equipment, although the price generally runs at least $10 a day plus deposit.

## Choosing the Craft

If you're like most people who try floating, it only takes one or two trips to know you've found a new pastime. Faced with steep rental prices, the next question follows logically. What kind of craft is best—canoe, raft, river boat or kayak?

Basically, it depends on individual needs. For fishermen, a stable craft usually works best. For the white water enthusiast, maneuverability is a must. The floating family, however, may want a stable craft that carries several people.

*Canoes*—While many old-timers look on canoes with disdain, most serious floaters prefer them. Contrary to common belief, canoes are neither tippy nor flimsy. Good crafts for nearly all Montana rivers, they paddle easily in slow water and maneuver well in fast. In addition, canoes (1) can carry lots of gear, (2) are light enough to carry on portages, (3) are easy to transport, (4) make excellent fishing boats and (5) can provide a new approach to hunting.

For someone purchasing a canoe, the array of sizes, models and materials can be perplexing. Generally, canoes range in size from 12-20 feet, with the standard size around 17 feet. Shorter canoes are lighter and more maneuverable, while longer canoes carry a heavier load and have greater stability. Models are generally determined by two factors—the keel (the "backbone" of the canoe) and the amount of curvature which the canoe has at each end. While a keel helps a canoe follow a straight line on a lake, it isn't necessary in a river and may hamper paddling. Greater curvature in a canoe usually means it floats higher in the water, a distinct advantage in fast rivers with high waves. But this curvature can cause problems on large rivers where strong winds blow high profile canoes sideways.

Canoes are made from wood, aluminum, fiberglas and ABS (acrylonitrile butadiene styrene) foam. While wood canoes have made their mark in history, they're rarely used today. Heavy and easily damaged, wood canoes can't compete with the new models. However, just as some people choose to hunt with black powder rifles, some purists still prefer the wooden canoe.

Most people choose between aluminum, fiberglas and ABS foam. All are light (about 75 pounds for a 17-footer) and reasonably durable. For good reason, aluminum canoes have been the largest sellers.

Extremely durable, aluminum canoes bounce off or scrape over rocks with little damage. They can withstand amazing punishment, yet last for years. Despite the rising cost of aluminum, they sell for a reasonable price, around $350 for a 17-footer.

While aluminum means lightness and durability, it also means noise. A paddle bumped against the side can spook a flock of ducks around the bend, and it may scare fish.

Much quieter than aluminum, fiberglas canoes glide over rocks more easily. However, a direct blow sometimes causes a hole—a major drawback of fiberglas. But patching fiberglas canoes is simple. They cost about the same or slightly less than aluminum models.

The newest line of canoes is crafted from durable ABS foam. It's also slippery, which helps the canoe glide over rocks. In addition, canoes made from ABS foam are quiet and don't become hot like aluminum. One major drawback is cost—well over $400.

Despite all the advantages of canoes, they do have a few shortcomings. First, they don't hold many people—three adults in a 17-footer. Also, a canoe in inexperienced hands can be unstable and large waves can fill it with water.

*Rafts*—Casual floaters often choose these highly buoyant crafts. For most rivers, they can carry the most people with the least danger. Since rafts bounce off most obstacles, less skill is required.

Like canoes, rafts come in several sizes and prices, ranging from inexpensive models to 37-foot monsters complete with motor brackets. Prices vary from $50-$700.

The most popular rafts are the four-, six- or ten-person rectangular models. Another type has recently come on the scene—inflatable canoes, for the person who wants some of the features of a canoe, yet doesn't want to pay the price.

When buying a raft, carefully check the quality of construction. If you're dealing with reputable companies, prices generally vary directly with quality. Beware of the $10 special—it often has only one air compartment, which means when it springs a leak, you're swimming. Such flimsily built rafts won't last long on rivers and are better saved for lakes.

Rafts should be equipped with oars and oarlocks. Paddling a raft with canoe paddles is difficult, and in most cases, it turns the craft in circles. For difficult rapids, oars and oarlocks are mandatory.

When approaching rapids, the oarsman faces downstream and back paddles to avoid obstacles. Maneuvering rafts through rough water isn't difficult to learn, but it can be hard work. Miscalculations usually don't mean a dunking as they may with canoes. Because of the buoyancy and stability of rafts, they're the safest craft for difficult rapids.

Safe rafting depends heavily on knowing the river where you plan to float. While rafts can safely negotiate most rivers, they can be dangerous on those that frequently meander or have log jams. Rafts,

which generally move with the current, have limited maneuverability. In a river that twists and turns, the current often flows under overhanging branches or cuts under brush-lined banks. It's difficult to avoid these obstacles in a raft. Strong currents may pin rafts against these obstacles, trapping the unaware floater. Log jams are a common cause of floating fatalities, especially during high water. Always inquire about hazards before rafting, and remember that only experts should try high water.

Lack of maneuverability isn't the only drawback of rafts. Rafters usually get wet, which limits trips to warmer weather. In addition, strong winds and lack of current can slow rafts to a snail's pace. And it's exhausting work to power a raft down a slow moving river.

*River boats*—the typical river boat—a flat-bottomed, 14-foot johnboat—isn't suited to swift moving waters. Because of its rectangular shape, it faces the same maneuverability problems as a raft. Yet, johnboats can't bounce off rocks like rafts, nor can they navigate in shallow water, Therefore, johnboats are really only suitable for relatively flat, slow moving rivers.

Other types of river boats, particularly the Mackenzie or Rogue River models, do well in faster waters. These 12- to 16-foot aluminum or wooden crafts are distinguished by their heavy curvature at each end. This curvature, called the "rocker," allows quick turning in swift currents. Frequently used by guides on the Madison River, these river boats have great stability, allowing fishermen to stand up and cast from them.

However, they have limited use. First, they require deeper water than a raft or canoe, rendering them unusable on smaller streams. Heavy and difficult to launch, they're cumbersome to transport and require accessible rivers. Finally, price tags run as high as $800, often making them the choice of the serious fisherman with a particular river in mind.

*Kayaks*—These small, cigar-shaped crafts are almost always made of fiberglas. They run about 12-14 feet long, weigh about 25-40 pounds and are most often used for white water. The "typical" kayak is a 13-foot craft, selling for $300-$350, suitable for one person.

Unheard of in Montana 15 years ago, kayakers now form a small, but enthusiastic, group. Expert kayakers, equipped with wet suits and helmets, can sometimes be seen running tricky rapids in winter or during spring run-off.

The best way to get started is to have an experienced kayaker show you the ropes. If this fails, try kayaking classes which are available in most of Montana's major cities.

Kayaks have steadily gained popularity among serious floaters. A kayak's extreme maneuverability makes it not only safe but a joy to paddle.

*Besides scenic grandeur, a trip down the Jefferson River offers floaters excellent hunting and fishing. photo: Jerry Manley*

Its major drawback has been lack of space, but newer models have compensated for this.

## Equipment

When acquiring your floating equipment, personal flotation devices (PFD's) should come first. Throwable, seat cushion PFD's are okay for flat, slow moving rivers, but they're worthless in fast water. If the craft should capsize, seat cushion PFD's are swept away.

Like seat belts, a PFD isn't much good unless worn. Therefore, buy one that's comfortable to wear at all times.

The "horse collar" type is widely available, inexpensive and highly buoyant, but it can rub and chafe. Up a notch in price are the closed cell foam PFD's. They give excellent flotation and provide good insulation on cold days. They can become warm on hot days, though. Whatever the price, personal flotation devices are an inexpensive life insurance policy.

To fully enjoy a day on the river, you must have proper clothing. True, this ranges from bathing suits to long underwear, but these are the basic rules.

First, be a pessimist. Even when the weather forecast sounds good, take along a poncho and dry clothes in a waterproof bag. Trips in the rain or cold weather can be fun *if* you're properly equipped.

Pack several light layers of clothing and shed or add them according to changing weather conditions. Wool holds a special place in the floater's wardrobe, because it continues to insulate when wet. Windbreakers are also invaluable. Wear shoes at all times, as stream bottoms may have sharp rocks or sticks. Old tennis shoes work best.

Other important items include:

*wide-brimmed hats*—They shade your eyes from the bright sun and they're great protection from rain.

*sunglasses*—Invaluable on bright days, they cut the glare so water ahead can be properly "read." If you wear glasses or sunglasses, wear a protective strap in case of a spill.

*waterproof bags*—Every floater needs these to store maps, clothes, food, etc. Surplus stores carry inexpensive bags of rubberized fabric, but they wear out quickly. Polyvinyl bags are much tougher, but they cost more. Army surplus radio packs are excellent, but hard to find.

*ammunition boxes*—These study metal boxes equipped with waterproof seals not only keep camera gear dry but also protect it from hard knocks. The same goes for anything else that must remain dry and protected. They're available for about $3 at most surplus stores, but check them for water tightness.

*rope*—You'll need rope for tying your craft or for guiding it from shore through fast water. Two 10- to 18-foot lengths of ½-inch nylon rope—one for the bow and one for the stern—suffice. The rope can also be used for tying the craft to the car.

*car rack*—Most people haul their crafts to the river on top of their car. Aluminum brackets fasten securely to the rain gutters of the car without damage. These

brackets can be bolted to a 2"x4" crosspiece, long enough to carry one or two canoes.

While deciding what to take on a float trip, don't forget what to leave behind. Most floaters leave wallets, rings, keys, watches and other valuables at home or in the car. If you're planning to fish, don't leave your license at home.

## Hazards

While the river adventurer won't face the perils of Odysseus—Sirens, Cyclops or giant whirlpools—many hazards await the unwitting floater. The amount of danger is directly proportional to the flow of water. A spill that might be deadly in June often means only wet feet in August. For example, watch out for:

*diversion dams*—Unaware floaters can get swept over these five- to ten-foot high hazards. The greatest danger isn't with the fall (although it usually means lost equipment), but rather with deadly currents formed at the dam's base by falling water. These currents often suck objects (logs, boats, floaters, etc.) under the falling water, trapping them. These currents can also suck you in from below the falls, so enter far downstream when portaging around a dam. Should you become trapped in such a current, the only escape may be to dive under it to get in the current washing out along the bottom.

*fallen trees and log jams*—Experienced floaters would probably rank downed trees and log jams as the greatest potential dangers. Since a river may flow right through such obstacles rather than going around them, any object that gets too close may get trapped. Less maneuverable crafts face the greatest danger.

Many times a floater comes around a bend and sees a log jam or downed tree that appears to block most of the stream. While you may be able to slip through, don't wait until you're on top of the hazard to plan a course. Immediately go to shore and check the log jam—sound advice for any hazard, incidentally. Remember the creed of experienced floaters: "When in doubt, scout." A quick glance from shore will often point out an easy route, or scouting may reveal an impassable log jam.

*weirs*—These man made irrigation structures cause problems for the dozing floater. Strong currents can trap a craft against or behind these wood and metal structures. Or, if you're lucky, you might end up in a farmer's field.

*barbed wire*—Although this problem is usually limited to smaller rivers, always keep an eye for wire strung across the stream. Ranchers occasionally string a single strand across streams to keep cattle penned, unknowingly setting up a guillotine situation for the floater. If you don't see the wire in time to get to shore, lay back in your craft and keep the paddle in front of your face.

*rock gardens*—These long stretches of fast water sprinkled liberally with large rocks are a pleasure for the expert and a hazard for the neophyte. Know your ability when approaching such white water situations. If the stretch is too tough, either carry your craft past or guide it through using ropes.

If your craft tips over, remember these things. First, hold onto your paddle. Don't let it go unless you're in serious trouble. (Getting caught up the creek without a paddle isn't just a cliché.) Stay calm. If you're equipped with a personal flotation device and a cool head, danger is slight. Make sure you're upstream from your craft. A canoe full of water weighs more than a ton and is a dangerous projectile. Next, make sure your partner is okay. If the water isn't too cold, stay with your craft (on the upstream side) and guide it into calm water.

In cold water, hypothermia develops rapidly. Therefore, abandon your craft and get to shore immediately. Don't try to swim in fast water. It puts you in a dangerous head-first position. Instead, float down the river in a semi-crouch, leaning backward slightly and using your legs to fend off rocks, while gradually working toward shore. It's possible to go through extremely hazardous water like this. In fact, some people "river surf" for fun. This isn't recommended, but you may want to try it in a moderate current.

## The First Trip

Equipment in hand, precautions in mind, you're now ready for your first river cruise. Assuming it's midsummer (when all beginners should start), most streams should be in top floating condition. Nevertheless, a late run-off or heavy rains can keep rivers high, sometimes well into July. On the other hand, a dry summer reduces water flows to the point where floating is difficult. It's best to check river conditions with local officials or other floaters.

Select a river that matches your ability. Don't try white water until you're sure you can handle it. Even then, don't get in over your head.

Once you've picked a river, find a map, decide where to put in and take out and figure out the mileage. A 10-mile float usually takes about five hours, depending on the current, your type of craft and how much you stop. Keep in mind that miles on the river may be longer than miles shown on road maps. Lewis and Clark found this out on the Beaverhead River. On that winding stream, they estimated four land miles equaled eleven miles of river.

With the trip planned, one problem remains—how to get back to the car once you've finished your float. Here are the options: hitchhike, take a bicycle (many people stash a bike at the take-out point and then peddle back to their cars), ask someone to drive your car to your take-out point, run or walk or take two cars. This last option is the least desirable. It seems contradictory to the national energy dilemma to drive two cars perhaps 100 miles each to float a 10-mile section of river. It can be justified if several people are going together, or if it's a particularly long trip.

## The Overnight Trip

Montana has numerous rivers ideal for overnight ventures. Some of them offer more solitude than found in wilderness areas.

Since many floaters are backpackers, there's often little extra equipment to buy in preparation for an overnight float trip. Lightweight tents, backpacks, stoves and sleeping bags are ideal. Remember to pack gear in quality waterproof bags and tie everything into the craft securely. Keep the weight low and distribute it evenly.

When planning overnight trips, check maps to see if you can camp on public land. If not, ask permission from the landowner. Be sure to pick up all trash and don't leave a messy campfire ring. Conscientious floaters take along a bag to pick up trash others have left.

With proper preparation, almost anybody can have a safe and enjoyable float trip. If floaters pick up their trash and clean their campsites, nobody can tell they've passed by.

After starting to float rivers, most people make it a lifelong activity. There's something captivating about a free river, its scenery and solitude, that entices floaters to return again and again. This attraction is impossible to describe, so you'll have to find out for yourself.

## Canoe Paddles

After purchasing a canoe, you still aren't ready for your maiden voyage. First, you must learn how to paddle.

Buy three paddles—two to use and one spare. While the proper size often depends on personal choice, a paddle that reaches from the ground to between the chin and eyes is usually about right. A long paddle will prove cumbersome, while a short paddle will tire you quickly.

Wood paddles, made of pine or spruce, usually have about a six-inch blade and a rounded handle. They sell for $5-$10. Eventually, they crack or break.

Aluminum paddles have an aluminum shaft, a fiberglas blade about eight inches wide and a T-shaped handle. White water canoeists prefer them because they give finer paddling control. They cost $20 or more, which limits their use to serious floaters.

For beginners, execution of the actual paddling strokes isn't as difficult as knowing when to use them. Proper execution requires coordination between the bow and stern paddlers. Normally, the stern person chooses the course and does most steering, while the bow person provides power and watches for obstacles. In a tight situation, the bow person picks the path, while the stern person keeps the craft parallel with the current. Getting caught sideways on rocks or downed trees often results in a dunking.

The beginning paddler must learn to "read" the water, to tell where underwater obstructions are situated by looking at the river. Fishermen may have a head start here. Begin on easy rivers where mistakes won't mean disaster.

Generally, still water runs deep, and fast water runs shallow. Most floaters pick their paths by looking for "V's" formed by underwater obstructions. A "V" pointed upstream has a rock at its tip. Avoid these. On the other hand, a "V" pointed downstream marks the path between two rocks or a deep spot between shallow places. Follow these.

Also, notice the spots where the current runs at different speeds. For instance, the area directly downstream from a large rock often has a long narrow stretch of still water, with fast water on each side. For the beginner, catching the bow in this still water may spin the canoe around unexpectedly, causing a spill.

Many of these suggestions and warnings won't be completely clear until you take a trip or two. First, gain some experience on a lake or slow moving river. Then, step by step, work up to more difficult streams.

# Montana's Popular Floating Streams

This guide doesn't tell everything about every river. However, it contains basic information on 27 of Montana's most popular float streams.

Remember, the guide provides only basics. Thoroughly check out the stretch of river you intend to float before launching your craft. Rivers are living, dynamic, constantly changing systems. A channel free of barriers one year may contain a dangerous log jam the next. Or, man may have built a diversion dam for irrigation which creates a hazard for floaters.

As a safety precaution, rivers are ranked as suitable for beginners, intermediates or experts.

*Beginner*—Knows basic strokes and can handle his craft competently in smooth water. Has knowledge of hazards he might encounter and understands the difficulty of the stream he intends to float. A beginner is not a person who has picked up a paddle for the first time. Some preliminary training is necessary before taking that first trip.

*Intermediate*—Knows basic strokes and uses them effectively. Can negotiate fairly difficult rapids and

other hazardous situations. Can come to shore quickly to inspect dangerous spots, and knows when to portage. Can maneuver a canoe from bow or stern.

*Expert*—Must have mastered all strokes. Confident of his ability even in difficult situations. Has considerable experience in rough water.

### Beaverhead River

Formed by the confluence of Red Rock River and Horse Prairie Creek at Clark Canyon Reservoir, the brushy Beaverhead flows for about 43 air miles before joining the Ruby and Big Hole rivers to form the Jefferson River. Some say that if the Beaverhead were ever straightened out (perish the thought), it would stretch halfway across the state. Mostly, it meanders its way through farming country, although thick grass, willows, cattails and marsh grass often obscure the immediate view. Floaters are often treated to the sight of the lofty East Pioneer, Ruby and other mountain ranges. Thick river bottom foliage provides cover for many wild animals including white-tailed deer, great blue herons, beaver, waterfowl and sandhill cranes.

Since thick brush impedes access by foot in most areas, the float fisherman has a great advantage on the Beaverhead. A canoe in skilled hands guarantees a quiet approach to otherwise unreachable fishing spots.

Access to the entire Beaverhead for floating is adequate, but most of the popular float trips are between Clark Canyon Dam and Barrett's Dam. Public access points between Clark Canyon Reservoir and Dillon include Pipe Organ Rock, Barrett's Dam and the Montana 41 bridge. Between Dillon and Twin Bridges, public access is limited to county roads which occasionally cross the stream. North of Dillon, the river is much more isolated than south of town.

Canoes are probably best for the Beaverhead, as repeated bends in the river require maneuverability to stay out of the willows. However, small metal or fiberglas boats are also popular and in skilled hands, they are very maneuverable. Rafts could be punctured by sweeping into the sharp branches. Also, keep an eye out for fences, particularly in dry years.

While floating the Beaverhead requires skill, the water rarely runs deep or fast enough to cause much trouble should a spill occur. Therefore, beginners can refine their stroking skills once the water gets low, but they shouldn't try it in high water or cold weather.

Don't expect to find crystal clear water in the Beaverhead. Irrigation returns and natural siltation give the water a brownish cast. In dry years, the Beaverhead can get quite low and floating may be impossible.

Watch for low bridges between Clark Canyon Reservoir and Barrett's Dam. High water makes portages around these bridges necessary. Because of the dam, water levels can be high whenever needs for irrigation or flood control dictate. In October and November, lower irrigation demands and more ground water return result in high water, making the sharp bends treacherous. During these high water periods, beginners should by-pass the Beaverhead.

### Blackfoot River

Most streams run swiftly in the upper reaches and slow down on the lower parts, but the Blackfoot does the opposite. A brushy meadow stream in its upper reaches near Lincoln, the Blackfoot picks up steam and becomes quite difficult before its juncture with the Clark Fork near Bonner. Its sparkling water attracts large numbers of recreationists from Missoula and the surrounding area.

Floating begins where Landers Fork joins the Blackfoot about six miles east of Lincoln. The river flows rather placidly for the entire distance to the Scotty Brown Bridge, 33 miles west of Lincoln, meandering through farm lands and thick river bottom country that contains numerous white-tailed deer. Duck hunters often do well floating the upper stretches, particularly as the river flows through the marshy country near Ovando. Fishing can be quite good, especially for brown trout.

Although the water is basically slow and flat on the upper river, occasional log jams and fences across the stream pose problems for beginners. Canoes do quite well, and rafts are a possibility. Beginners can float this section, but should stay off this stretch during spring run-off. At the lower end of Box Canyon (a few miles above Scotty Brown Bridge) is a rapid that can swamp inexperienced canoeists using uncovered canoes. From the access point four miles below Scotty Brown Bridge to Johnsrud State Park, the river is fast moving and dangerous. Large rocks create turbulent currents that can capsize inexperienced floaters.

Between Bear Creek Flat and the Clearwater Bridge, the water is especially difficult. Expert canoeists find this stretch challenging, and it's a favorite early season spot for kayakers. But it's definitely not for beginners.

Access is very good on the lower Blackfoot, with various parks, campgrounds and fishing access points. Probably more than 90% of the floating on the Blackfoot takes place below Clearwater Junction. The Johnsrud State Park area is very popular.

Below Johnsrud State Park, the river slows down and floating becomes easier. Watch for occasional rocks and snags, and don't forget about Milltown Dam at Bonner.

While the Blackfoot is suitable only for experts during high water, intermediates might try the water from the Clearwater Bridge to Johnsrud after spring run-off. Watch for the rocky section near the bridge at Roundup Bar and for the Thibodeau Rapids below Whitaker Bridge. There isn't a place to get out at McNamara Bridge; get out at the landing about one-half mile before it.

The stretch below McNamara landing poses little problem for rafters, although canoeists will need some experience to avoid occasional obstacles. Most people get out at the weigh station near Bonner.

Probably the most floated section of the river lies

*Above, fishing on the North Fork of the Flathead River. F&G photo: Steve Bayless. Kayaking, an increasingly popular method of floating rivers. photo: Jon Keefe*

between Johnsrud State Park and the weigh station. At low water, this section is suitable for beginners.

Never float close to the U.S. Plywood plant at Bonner, because there is an extremely dangerous dam. This is made even more treacherous because of lack of room to portage.

### Big Hole River

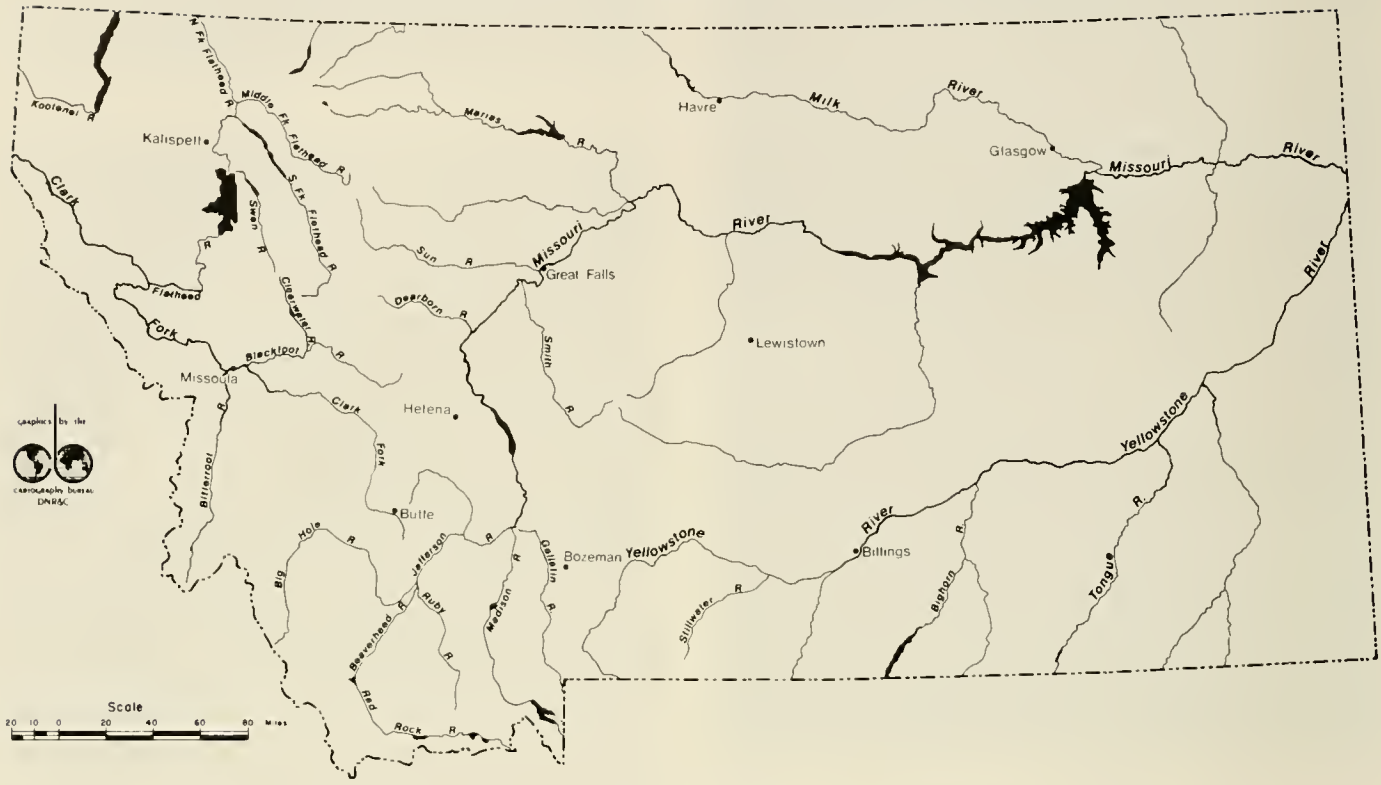
One of Montana's best known float streams, the Big Hole offers diverse floating from its start near Jackson to its confluence with the Beaverhead.

Floaters can start at Jackson, although here the river is small and sinuous all the way to Wisdom. The river continuously splits into channels, and barbed wire fences frequently cross the stream. This section is floatable only early in the year during high water, and it takes a good intermediate paddler to negotiate the sharp turns and fast current. Fishing for brook trout and occasional grayling can be very good, especially early in the season.

About 10 miles north of Wisdom, the river changes from a braided, winding stream to a broad, flat, slow river. From this point to the town of Wise River, the river typically is broad and shallow, providing good floating for beginners. Early in the year, this stretch can be quite productive for rainbow and brook trout and Arctic grayling. Fishing tapers off during the heat of the summer, however, as this section experiences high water temperatures. Access is good along this stretch and the swimming is great.

Near Wise River, the Big Hole enters a small canyon that continues until Divide. The canyon is

# Montana's Popular Floating Streams




difficult only during run-off. *Watch carefully for the diversion dam at the Big Hole Pumping Station about one-half mile above the highway bridge before Divide. This section is hazardous and several lives have been lost.*

Most fishermen concentrate efforts on the blue ribbon water between Divide and the Big Hole's juncture with the Beaverhead. Here the river changes character again, flowing mainly through cottonwood bottoms and forming deep pools and long riffles. Repeated meanders and occasional log jams require extra caution on this section, especially during high water.

Below Divide, the water becomes too difficult for beginners. Rafts and canoes are used on this often-floated portion of the river. The Dept. of Fish and Game owns fishing access sites at Maiden Rock and Glen, with county bridges providing additional access. Float fishermen have an advantage on the Big Hole, because much of the river flows through private land, making access difficult. The Big Hole has acute problems with dewatering for irrigation. The river becomes lowest near Divide and near the mouth; irrigation diversion and dewatering may keep the floater off the river in dry summers.

### Bighorn River

Very popular with Billings floaters, the Bighorn River offers exceptional float fishing and waterfowl hunting opportunities while flowing through relatively undeveloped bottom land. Most floaters start below Yellowtail Dam at the Afterbay Recreational Area and take out 13 miles downstream at Bighorn Fishing Access Site. This stretch offers exceptional trout fishing for rainbows and browns, commonly up to 10 pounds. Good fishing on the Bighorn isn't a particularly well-kept secret, however, and it's heavily floated.

The Bighorn has more than fishing to offer, as it winds through arid bench land and cottonwood bottoms. It's very rich in aquatic vegetation, which lures many types of wildlife, particularly birds. Not only are large numbers of waterfowl present, but shore birds are also numerous, especially during migration. Eagles often congregate along the river in winter to prey on mallards which inhabit this stretch.

While an Afterbay to Bighorn float is the most popular (as many as 60 boats per day), floating may be just as good between the Bighorn and Two Leggins Fishing Access Site. It's a 20-mile, one-day float, but get an early start.

The Bighorn River flows through the Crow Indian Reservation and any trespassing may result in arrest. Floaters must stay within high water marks on the river. Floaters shouldn't take out or put in at St. Xavier Bridge, or at any point other than fish and game or other public access points.

A recent court decision closed (at least temporarily) much of the Bighorn River to hunting and fishing by non-Indian sportsmen. So check the status of the closure before hunting or fishing on the Bighorn.

In addition to the Bighorn and Two Leggins access

points, the department also has an access at Arapooish, just north of Hardin. Plan on taking out only small craft at the Two Leggins and Arapooish sites, because the banks are not graded for trailer access.

Below Hardin, the fishery is essentially warm water, with good fishing for sauger, shovelnose sturgeon, pike and channel catfish. Waterfowl hunting is also good in this area. However, access is difficult, because much of the river flows through private land. Obtain permission first.

Floaters use all kinds of crafts on the Bighorn. Motorboats and airboats often frequent the river, so be prepared for some noise. With some caution, this river can be floated by beginners. The river channel occasionally splits, and snags in the river can cause problems. Also, rafters should watch out for approaching wind fronts in late spring and early summer.

Watch for a low diversion dam located on the downstream side of the old Two Leggins Bridge. Below Hardin, there are the Kemph and Manning diversion dams.

### Bitterroot River

Though often abused along its 80-mile path, the Bitterroot River still retains much of the beauty of which early explorers and fur trappers often spoke. Broad and gravel bottomed, this popular stream flows through thick cottonwood bottom land from Conner to its juncture with the Clark Fork near Missoula. All of the river is floatable, and people use it heavily, not only for the excellent fishing but also for the beautiful scenery as it threads its way down the mountain-shrouded Bitterroot Valley. Floating is also possible on the East and West forks of the Bitterroot, although fast water and log jams make it hazardous. On the main river, floaters often start at the U.S. 93 bridge between Conner and Darby. On the upper stretch, it takes an intermediate floater to negotiate the frequent log jams, fast water and sharp bends. Diversion dams are also a problem on the upper reaches of the Bitterroot, particularly two between Darby and Hamilton and two more between Corvallis and Victor.

The hand of civilization is never far away when floating the Bitterroot. Extensive riprapping (both rock and car bodies) mars the scenery and hurts the fishery. Most of the riprapping has been done to accommodate the burgeoning number of trailer homes that occasionally lines the river's edge. The stretch from Stevensville to Florence has been so heavily riprapped with old car bodies that it's popular only with antique car buffs.

Despite the abuses, the river bottom retains some wildlife, including deer, beaver and a variety of birds. Of special interest are great blue heron rookeries and osprey nests.

As the river nears Missoula, it slows and broadens and floating becomes safer. Beginners usually do all right from Florence downstream when the water is low. The entire river is treacherous in high water because of downed trees, and many boats are lost each spring.

Access isn't a major problem for Bitterroot floaters, because highway bridges are usually spaced about right for a day's float. Department fishing access sites are situated at the U.S. 93 bridge south of Darby, at Florence Bridge and at the county line (Chief Looking Glass). While floating pressure on the entire Bitterroot is fairly high, it's spread out. Floating may be difficult during dry years, since large amounts of water are removed for irrigation, especially in the Victor area.

### Clark Fork River

The Clark Fork River, which starts its long trek across western Montana near Deer Lodge, is floatable for much of its 200 miles before entering Idaho. While most floating is done on the broad, deep section of the river below Milltown Dam at Bonner, many recreationists find the brushy, winding upper section to their liking.

Although the river is virtually paralleled by Interstate 90 and the Burlington Northern railroad line, access can be difficult. County bridges near Garrison Junction, Gold Creek and Drummond provide access, as do department access points at Turah, near Bonner. Floaters should stay on the river when floating the upper Clark Fork, as it flows through private land.

Despite its proximity to civilization, the upper Clark Fork offers beautiful scenery and occasional wildlife, particularly deer, waterfowl and song birds. The highway is often far enough from the river so as not to be noticed. Water quality improves noticeably as one moves further away from Butte and Anaconda, especially when Rock Creek enters about 20 miles east of Missoula. Large trout are often caught on the stretch between Rock Creek and the Milltown Dam.

The upper Clark Fork is well suited to canoes and small boats, but too winding for rafts. Repeated bends in the river, occasional fences and diversion dams restrict this section to intermediates.

The lower Clark Fork below Milltown Dam is a large, broad river, passing mainly through cottonwood bottoms. Downed trees and fast currents make it dangerous during run-off.

One scuba diver reports the stretch of water between Bonner and Missoula holds the remains of over 20 canoes. Nevertheless, this lower section of the river is not difficult to float after run-off, which sometimes lasts until early July. Beginners in rafts rarely have any difficulty once the water lowers, and canoeists need only brief experience. The Clark Fork is probably the easiest floating in the Missoula area.

Access is fairly good on the lower river, with several bridges near Missoula. One popular float with Missoulians starts on the Bitterroot River at the Maclay Bridge and ends up about six miles downstream at Harper Bridge. From this point, the Clark Fork winds past smelly Hoerner-Waldorf and continues placidly until it reaches Alberton. Not far downstream from Alberton, Cyr Canyon prohibits all but the most experienced from further passage. People in canoes or small rafts should avoid this

stretch. It's only for experts in kayaks and large rafts. A commercial outfitter now takes people on float trips through this dangerous, but scenic, section. (See white water section.)

Safe floating starts again near Tarkio and continues to Thompson Falls with only minor rapids. Watch for Cascade Rapids—200 yards of difficult water—between St. Regis and Paradise. Beginners should portage this difficult spot.

The other fast water section occurs right after Plains, but it isn't too difficult. Beginners may want to portage, however.

Much of the float from Tarkio downstream to Thompson Falls flows through relatively intact shore lines, with mountains flanking the river on each side. Water quality is only fair in this lower section, although large trout are occasionally caught.

While the Clark Fork is fairly easy, it isn't recommended for first-time floaters. Master a couple of easier rivers before trying this big, deep river. Beware of high water unless you're an expert.

### Clearwater River

Although only floatable for seven miles below Salmon Lake, the Clearwater River still merits attention. It flows through both swamp and timbered bottoms as it winds to its juncture with the Blackfoot, providing a pleasant float.

While floating can start at Salmon Lake, it's highly advisable to begin at Elbow Lake a mile downstream, because a very difficult rapids lies between the two lakes. Only experts should attempt this stretch.

From Elbow Lake to Clearwater Bridge, floating is easy. Below Clearwater Bridge, the river becomes more difficult as it heads for the Blackfoot, but beginners can still handle this. Beginners should take out before hitting the Blackfoot, however, as very difficult water marks the path to the next access, the Montana 200 bridge near Roundup Bar.

### Dearborn River

Beginning high on Scapegoat Mountain, this bubbling stream has carved a deep and beautiful path as it winds its way through the former land of the Blackfeet Indians before entering the Missouri between Helena and Great Falls. It's a relatively small stream—but of high quality. In fact, Lewis and Clark were particularly struck by the Dearborn's clarity, accentuated by brightly colored stones on the stream bed.

Although floaters may begin as high as the Highway 434 bridge, the most popular and scenic float is from the U.S. 287 bridge to the Missouri River. Although the distance is only about 12 air miles, the river twists and turns as it cuts through a canyon, making this a mandatory two-day trip. Outstanding scenery, including sheer walls and unusual rock formations, makes the floater want to stay even longer.

This river isn't for beginners, as several swift spots interrupt the peaceful flow. While most last for only short stretches, one difficult spot (about five miles before reaching the Missouri) lasts for about 300 yards. It's possible to portage around it, however.

*Above, A. J. McClane with a nice brown trout caught while floating the Missouri River near Helena. F&G photo: Steve Bayless. Floaters often stop to explore the cliffs along the wild Missouri, recently protected from impoundment by congressional designation under the Wild and Scenic Rivers Act of 1969. F&G photo: Dick Ellis*

For the most part, the Dearborn offers a good semi-wilderness float, as evidence of man is essentially lacking. In the lower stretches, however, subdivisions and other signs of human habitation are beginning to pop up along the river banks.

Many forms of wildlife can be seen along the Dearborn, including deer, beaver, coyotes and rattlesnakes. Falcons, kingfishers and cliff swallows make good use of the lichen-covered canyon walls. Fishing is often good on the Dearborn for rainbow and brown trout.

After mid-July, low water hampers floating on the Dearborn.

### Flathead River—main branch

Although overshadowed by its three forks, the main branch of the Flathead River also offers some good floating, particularly for beginners. This is big water and it moves slowly after spring run-off with

few hazards.

Floating starts above Columbia Falls where the South Fork enters. The South Fork also brings in one of the main Flathead's few hazards. Releases from Hungry Horse Reservoir can cause two- to three-foot water fluctuations. From where the South Fork enters all the way to Flathead Lake is an easy, popular float.

Below the lake, floating starts at the county road bridge about four miles downstream from Kerr Dam. Immediately below the dam are the Buffalo Rapids, which are only for experts.

From the county bridge below Kerr Dam to where the Flathead joins the Clark Fork, the Flathead rolls through some scenic country as it goes by the National Bison Range near Moiese. The water near Dixon is popular with waterfowl hunters.

Department owned sites include Teakettle at Columbia Falls, Kiwanis Lane and Old Steel Bridge at Kalispell, Sportsmans Bridge on the short section of Highway 208 and Bigfork and Wayfarers on Flathead Lake. Access to the Flathead below the lake is rather spotty, although highway bridges cross at Dixon, Perma and Paradise.

**South Fork of the Flathead River**

If you really want to see the Bob Marshall Wilderness, float down the South Fork. This wild river provides a unique vista of Montana as it used to be.

Understandably, access is quite limited as the South Fork flows through wilderness. Most people enter via Holland Lake and Gordon Creek, a distance of about 27 miles, using pack horses to carry gear. Others pack in over Pyramid Pass and reach the South Fork via Youngs Creek. Most floaters wait until at least July before trying the South Fork.

The float trip from Big Prairie (where Gordon Creek joins the South Fork) to Spotted Bear covers about 50 miles and takes four or five days. Most people make the trip in four-person rafts, two per raft with about 60 pounds of gear. Campsites are easy to find along the river.

While the South Fork isn't particularly dangerous, it isn't for beginners. Intermediate skill is required for much of the river. Watch for a virtually impassable gorge near the junction of Bunker Creek. Signs warn of the gorge, and a three-mile portage is required. While a handful of experts have made it through (with three mandatory portages), this gorge is deadly. At times the river squeezes down to only five feet wide as it roars through the canyon. Most floaters put back in near Harrison Creek.

The airfield at Meadow Creek (just outside the wilderness boundary) and the Bunker Creek Road provide limited access. The Bunker Creek Road access site requires a short hike down Cedar Creek to reach the river. Access is easy on the six-mile stretch from Spotted Bear to Hungry Horse Reservoir.

For kayakers, there's some good water below Hungry Horse Reservoir. But it's too rough for canoes and cheap rafts.

**Middle Fork of the Flathead River**

Often referred to as "Montana's wildest river," the Middle Fork starts high in the undisturbed reaches of the Bob Marshall Wilderness. It flows through about 25 miles of *de facto* wilderness before reaching U.S. 2, which it parallels for another 35 miles before joining the North Fork of the Flathead River.

The most common access to the wilderness section of river is by airplane via Schafer Meadows, which is only three miles downstream from the Bob Marshall Wilderness. The water is only for expert rafters and kayakers. This wilderness stream is isolated, and the scenery is outstanding, as the river pours through thick timber and glaciated valleys.

The first easy access comes at Bear Creek, after the river nears U.S. 2. The river is still difficult here—definitely too rough for open canoes. Kayakers like the stretch between Bear Creek and Essex. Canoes can be used from near Tunnel Creek to Nyack, although tricky currents and occasional log jams

## Why a Floating Guide?

The Dept. of Fish and Game has several reasons for publishing this floating guide. First, it's intended to encourage preservation of free flowing rivers. Anybody who has floated a free river, relished its quiet beauty, fished for its wild trout or challenged its white water, will likely resent its destruction. There are many threats to Montana's natural waterways—dams, stream side subdivision, channelization, water depletion, pollution—to name a few.

A guide of this type must be published with some reservation, however. Today, most Montana rivers see only a few floaters each year. But as the sport becomes more popular, managing agencies may be forced to limit the number of floaters and enforce other restrictions. This has already happened in Idaho, Oregon and other states.

However, greater threats loom than overuse by recreationists. Limiting the number of canoes going down a river is easy compared to preventing impoundment, channelization, depletion or pollution of wild waterways. With public pressure—including the support of those who have floated—such tragedies can be denied.

In addition, this guide should help answer numerous inquiries the department receives for information on floating in general and for details on specific streams. Last, the guide should help recreationists more easily and safely take advantage of a tremendous outdoor opportunity—floating a free flowing river.

So pick a river that suits your fancy and ability and have a safe, enjoyable trip. Hopefully, a day or more on some of Montana's sparkling streams will give you a personal stake in their future.

restrict it to experts.

After Nyack comes John Stevens Canyon, which contains some very difficult water. (See white water section.) This stretch is only suitable for large rafts and kayaks in the hands of experts. The water stays too difficult for canoes until West Glacier, where the river widens and slows down. From West Glacier to Blankenship Bridge is a good, short float for beginners.

### North Fork of the Flathead

One of Montana's most popular float streams, the North Fork of the Flathead flows out of Canada and along the west boundary of Glacier National Park for 58 miles before joining the Middle Fork at Blankenship Bridge. This beautiful, glacial-green river rushes through mostly untrammeled country, with the towering peaks of Glacier often in sight. Presently, North Fork water is pure, but proposed coal development in Canada and energy and residential development in the United States could change this.

Access to the North Fork is fair, considering its near-wilderness setting. An undeveloped road parallels the stream, but it rarely comes close enough to be seen by floaters. In Montana, floating begins at the Canadian border and continues throughout the length of the river. From the border to Polebridge, the river is suitable for intermediates. Occasional log jams and fast currents provide a challenge, particularly during high water. From Polebridge to Big Creek, the river is easier, but still too difficult for beginners. An early season spill in the North Fork's chilly waters can be dangerous.

The most difficult section of the North Fork is found between Big Creek and the Blankenship Bridge. Log jams are common and the water is quite swift. Here, about two miles above Canyon Creek, lie the Fool Hen Rapids. When water is high, they are passable only by experts. In fact, many experts don't make it through right-side-up during canoe races conducted on the North Fork each spring.

Those doubtful of their ability should wait until at least mid-July for a North Fork trip. Fall is a good time to take a cruise, although water may become low in dry years.

Fishing for both cutthroat and bull trout can be very good on the North Fork. Wildlife is particularly abundant along the North Fork, including black and grizzly bears, deer, eagles, moose and beaver.

The North Fork is regularly floated with both canoes and rafts, but rafters should be especially wary of log jams.

Floaters should avoid wearing hip boots or waders while paddling the North Fork. This has caused several drownings in recent years.

### Gallatin River

The Gallatin River consists of two forks, the East and main stem Gallatin rivers. Both are floatable, but they differ sharply in character. The East Gallatin is a winding meadow stream with some pollution problems. The main stem Gallatin is a swift moving, high quality stream renowned for good fishing and excellent white water boating. (See white water section.)

The sinuous East Gallatin with its brushy undercut banks provides good fishing and year-round floating from near Dry Creek on downstream. Below Dry Creek to the junction with the main stem Gallatin is for beginners. Above Dry Creek, however, more experience is required, as low water and fences cause problems, especially for rafters.

The main stem Gallatin pours and tumbles its way from Yellowstone National Park to Gallatin Gateway, providing recreationists with top quality white water excitement. Although the stream mellows below Gallatin Gateway, log jams make it extremely hazardous. Excellent access along the upper part of the main stem Gallatin has made this river very popular. Most of the white water fun takes place early in the year, however, as the water becomes low after about mid-July.

The main stem Gallatin is strictly for experienced floaters. From Taylor Fork to the West Fork (of the main stem Gallatin), is for intermediate canoeists, rafters and kayakers. Below this point, the stream becomes much more difficult. From the West Fork to Squaw Creek is only for experts in covered canoes, large rafts or kayaks. The most difficult part of the main stem Gallatin, suitable only for highly skilled experts, is the two-mile section of river below the highway bridge at Cascade Creek. Large rocks in the stream not only provide obstacles, but also create tricky currents that can—and often do—dunk floaters. The famed House Rock Rapids, visible from the highway, are the most challenging of all. This water requires high flotation life jackets, wet suits and helmets.

While the main stem Gallatin loses its rapids below Squaw Creek, it remains treacherous until it reaches the East Gallatin. The river frequently splits and has numerous log jams that may completely block the river and a few irrigation diversions can be dangerous, too. Rafters should stay away, and only expert canoeists or kayakers should try this water. Unlike the upper main stem Gallatin, access to this lower section is quite poor. From Gallatin Gateway downstream, irrigation dewatering may prohibit floating.

The two forks of the Gallatin join near Manhattan at Gallatin Forks Fishing Access Site and provide easy floating down to Lyman Bridge near Logan. Occasional log jams make the float from Logan to the headwaters of the Missouri River tricky, requiring intermediate skill. This lower section offers fair waterfowl hunting.

### Jefferson River

The Beaverhead and Big Hole rivers join near Twin Bridges to form the Jefferson. The Jefferson then flows through 60 miles of mostly arid bench land and irrigated farm land as it slowly makes it way toward the headwaters of the Missouri. This section also includes the canyon area near Lewis and Clark Caverns. Often, floaters on the Jefferson are

*Outfitters use river boats on the Madison River. above photo: Hank Fischer. Several Montana communities organize float trips, such as the KEIN-Jaycee Great River Raft Race. F&G photo: Paul Bushaw*

treated to outstanding scenery, particularly as they sweep by the base of the Tobacco Root Mountains.

The winding Jefferson has brushy banks and murky water, the latter largely a result of irrigation run-off. Despite the cloudy waters, the year-round trout fishing is good, especially for large browns.

Access points to this popular stream include the Ironrod Bridge at Silver Star; Parrot Castle, Cardwell, Williams Bridge and Drouilliard Fishing Access sites and Three Forks. While the entire river offers first-rate floating, two sections deserve special mention. The first is the Silver Star to Parrot Castle section where the river flows by the Tobacco Root Mountains. However, watch for the diversion dam at Waterloo. It's dangerous. Next is the Cardwell to Sappington trip past the Lewis and Clark Caverns. During low water years, an occasional diversion may block the entire stream making portaging a necessity. Limestone cliffs and interesting rock formations mark both sections.

Probably the best stretch for observing wildlife is the short float between Three Forks and Trident, where the Jefferson, Madison and Gallatin rivers join to form the Missouri. Here, the river breaks into several channels and becomes fairly brushy. Ducks, geese, deer and moose are often sighted in this wildlife-rich area. This stretch requires some experience (intermediates), as the water gets faster.

Except for the section below Three Forks, in summer the Jefferson is suitable for beginners. Watch for diversion dams, however. All types of crafts are suitable.

During dry years, the Jefferson may become quite low, mainly due to irrigation withdrawals. The problem is generally most acute in the vicinity of the Ironrod Bridge.

### Kootenai River

Formerly one of Montana's finest float trips, Libby Dam has cut down floating on this river, Montana's second largest, to a scant 38 miles. Formerly, floaters could cruise through nearly 150 miles of virtually undisturbed river bottom on a stream that boasted excellent fishing. Part of the remaining 38 miles will likely be lost to a reregulating dam.

The Kootenai begins in Canada and takes a large loop through Montana and Idaho before returning to Canada. In Montana, it flows through narrow canyons and forested slopes before crossing the Idaho border.

Floating starts below Libby Dam and continues past Libby. Although most local floaters use small aluminum boats, canoes and rafts are suitable. Intermediate experience is necessary, because this is a big, powerful river. Below Libby, as the river approaches Kootenai Falls, there's some difficult water known as China Rapids. All but the very best canoeists portage this section. In experienced hands, rafts and kayaks can make it.

The power line just before impressive Kootenai Falls marks a good portage point. Don't venture close to the falls. Below the falls, the water is very difficult for about two miles. Only experts in kayaks and large rafts should try it. Because of the great fluctuations in the amount of water discharged from Koocanusa Reservoir (resulting in changes of two to four feet in river levels), each of the five rapids in this two-mile gorge should be inspected on foot before attempting to put in below the falls.

After Troy, and particularly past the point where the Yaak River flows in, lies the last vestige of the Kootenai as it once was. This section is relatively undeveloped and fishing is good. Most floaters take out at Leonia, Idaho.

### Madison River

Formed by pristine sources high in Yellowstone Park, the Madison is one of Montana's most popular float streams. Described by one author as "one big riffle," the Madison flows swiftly in its upper reaches, but slows down in the lower section. Madison Dam, near Ennis, is usually recognized as the dividing point between the upper and lower river.

As the upper Madison heads for Ennis Reservoir (formed by Madison Dam), its surface is broken occasionally by large boulders. Picturesque scenery marks the upper river, with the lofty Madison range to the east and dry sagebrush and sandstone country to the west. Access is good, with campgrounds near the river making overnight trips simple.

Floating on the upper Madison begins about four miles downstream from Quake Lake at the Highway 87 bridge. Stay away from the river directly below Quake Lake. Sharp, jagged rocks make this stretch virtually impassable for most floaters. Even experts don't enjoy it.

Fishing is the big attraction on the Madison. Several professional outfitters offer guide service on the upper Madison (using river boats) and many visitors to Montana enjoy this outstanding float trip. (Check fishing regulations because fishing from a boat is permitted only on certain parts of the upper Madison.) Although the current is swift, the absence of hazards makes the upper river an easy, late season trip for rafters and canoeists with minimal experience. A trip during spring run-off requires experience, however.

The upper river changes character after it passes Varney Bridge. Here, the river braids into several channels, making floating more difficult and too tough for beginners. On this section, low summer flows occasionally require floaters to drag crafts over exposed sand bars. Waterfowl hunters occasionally float this section.

Formerly one of the most productive fishing streams in Montana, the lower Madison now suffers from thermal problems caused by Madison Dam and Ennis Reservoir. While nonfishing floaters may enjoy the warm temperatures, trout don't. Despite high temperatures, however, fair fishing remains in parts of the lower river.

Floating on the lower Madison begins below the dam, although not for everyone. Here, the river descends rapidly into the rugged, inaccessible Bear Trap Canyon, where floating is very hazardous. (See

white water section.) This water provides good white water sport for experts in kayaks or large rafts. Small rafts or open canoes don't have a chance. Bear Trap Canyon is doubly dangerous because of its inaccessibility—help may be very far away.

While the lower Madison is tumultuous as it gushes through Bear Trap, it's wide and easy for the rest of its run to the Missouri Headwaters State Park.

The lower Madison is quite popular and a good river for beginners. Access on the lower section of the river is limited, although a county road follows the river much of the way to Three Forks. Public land borders the river from Bear Trap Recreation Area down to where U.S. 287 leaves the river (it becomes Highway 289) and heads toward Bozeman. About five miles below that spot is Greycliff Fishing Access Site. Cobblestone, a new access point midway between Greycliff and Three Forks, should be ready for use soon.

While fishing and pleasure floating receive most of the attention on the lower Madison, waterfowl hunting can be good on the last few miles.

**Marias River**

Another of Montana's overlooked float streams, the Marias begins about 12 miles south of Cut Bank, where Cut Bank and Two Medicine creeks join. While it's possible to float from this point down, most floating occurs below Tiber Reservoir. Fishing isn't as good above the dam, nor is the scenery as appealing.

Below the dam, the water is suitable for beginners. Three highway bridges below the dam provide most of the access. The trip from the Highway 223 bridge to the Missouri River at Loma is probably the most scenic section. Here, the river winds through desolate breaks country, complete with towering sandstone formations and few signs of civilization. The trip from the Highway 223 bridge to Loma takes two days, or it can be cut in half by getting out at the road south of Rudyard.

While trout fishing is available for about 15 miles below the dam, the warmer and more turbid lower reaches support walleye, northern pike, goldeye and an occasional paddlefish. Waterfowl hunters also float this river, as ducks and geese often stop here during fall migrations.

There's only one real hazard on this easily floated river—mosquitoes. Dress properly and carry repellent.

**Milk River**

The Milk River flows out of the undisturbed forests of Glacier Park as a clean, mountain stream. Then, it enters Canada north of Cut Bank. After its loop into Canada, the Milk returns to Montana as a changed stream, carrying a heavy silt load. The Canadians aren't to blame, however, because much of the silt is natural. Despite the turbidity of this river, it still offers exceptional fishing and good waterfowl hunting.

Floating on the Milk starts below Fresno Dam and continues for about 250 miles, where the Milk empties into the Missouri near Fort Peck. This muddy river winds through thick river bottom vegetation and open range land. While official access sites are limited (Rookery, west of Havre), state and county roads frequently cross the river.

This slow, meandering river is easy floating for the most inexperienced beginners, with occasional diversion dams providing the only real hazard. The Milk flows through a variety of habitats, and wild animals are often sighted.

Fishing is no doubt the most common motive for a Milk River float, particularly for walleye, northern pike and catfish. Trout fishing is available only for a few miles below Fresno Dam. Fishermen also have good luck at the points where feeder streams enter the river, and at the mouth of the Milk itself.

The most popular fishing area probably lies between Dodson and Vandalia. This stretch has some of the best walleye stream fishing in the state, and fish up to 10 pounds are taken frequently.

For waterfowl hunters, the section from Glasgow down to the Missouri is popular. Canada geese often frequent this section.

**Missouri River**

Montana's Missouri, especially its 149-mile stretch of wild river, holds a special place among floaters across the country. Noted for not only its scenic value but also for its historical significance, the Missouri winds its way through mountainous terrain near Great Falls before widening and flowing gently through rugged breaks country.

The Missouri is, in short, an easy float—wide and flat, with only an occasional riffle. The "rapids" marked on many maps in the wild section are only difficult if you're piloting a steamboat (as they did in

## Floating Through Private Land

Most Montana rivers—even some of the most popular streams—flow through private land. Some floaters incorrectly assume all land between high water marks is, in essence, public land. Unfortunately, most river beds are legally classed as private land. Floaters can be cited for trespassing if they leave their crafts.

Some legal action has recently taken place on this problem. As a result, part of at least one major floating stream, the West Gallatin, has been opened for recreational use between low water marks. And perhaps similar litigation will open more rivers in the future. For now, most floating recreation exists because the private landowner allows it. So, check out land ownership before taking a trip. If the stream crosses private land, ask permission before floating the river and don't litter or damage private property while on the water.

the 1800s). Although rafts are frequently used, a canoe is probably the ideal craft for the Missouri.

The section between Three Forks and Great Falls has some fine floating, but unfortunately dams have changed the primitive nature of the upper river. The section from the headwaters of the Missouri to Toston Dam remains relatively undisturbed, however, as it flows through inaccessible farm and ranch land. In this section, the department owns Midway Island and Fairweather Fishing Access sites. Here, trout fishing and waterfowl hunting are usually good.

The float from Toston to Townsend (at the head of Canyon Ferry Reservoir) is the next possibility. Brown trout often congregate in this portion of river, as Toston Dam blocks fall spawning runs. Besides a short float from Hauser Dam to Holter Reservoir, the next floating opportunity is below Holter Dam near Wolf Creek. Numerous accesses are possible from the Missouri River Recreation Road. Here, the River stays wide and flat for several miles while approaching Great Falls. Although less popular than the lower section, this upper river provides good trout fishing and outstanding scenery.

The Missouri River from Great Falls to the North Dakota border is the best known section of river. It contains the 149-mile section between Fort Benton and the Fred Robinson Bridge recently included under the Wild and Scenic Rivers Act of 1969. While people come from across the country to float this popular section, they—at least those with motorless crafts—seldom disturb each other. This primitive part of the river is practically devoid of civilization, and many types of wildlife—including deer, elk, pelicans, bighorn sheep, beaver and coyote—still abound. Fishing in the turbid waters of the lower Missouri is restricted to warm water species such as sauger, northern pike, catfish, goldeye, shovelnose sturgeon and paddlefish.

Access points to the lower Missouri are widely spaced, thus retaining the river's primitive character. In descending order—heading downstream—points for launching on the free flowing portion of the river are found at Fort Benton, Loma Ferry, Coal Banks Landing Recreation Area, Virgelle Ferry, Judith Landing and the Fred Robinson Bridge. The section from Coal Banks Landing to Judith Landing contains the highly scenic White Cliffs area. It can be floated in two days.

Although not officially designated a "wild" river by federal law, the Missouri below Fort Peck Reservoir is also scenic and primitive. Here, the rough breaks country merges with woodlands as the Missouri approaches North Dakota. Fox squirrels, which have recently expanded their range into Montana, can often be seen in the trees near the river. Floaters might also spot white-tailed deer and waterfowl. The most scenic stretch is the section between Culbertson and Fort Union, while fishing is best from Fort Peck to Wolf Point.

### Red Rock River

The remote Red Rock River is no doubt among Montana's least floated rivers. Yet, it offers unique scenery and abundant wildlife, particularly as it flows through the Red Rock Lakes National Wildlife Refuge, which recently became a wilderness area. Formed in the Centennial Mountains just west of Yellowstone Park, the Red Rock River flows through one of the most scenic and undeveloped valleys in the state.

Floating begins on Upper Red Rock Lake. A short paddle across the lake takes canoeists (no motors allowed) to the river, which then winds and twists its way through thick swamp land for about seven miles before emptying into Lower Red Rock Lake. This journey through undisturbed marsh takes a complete day and requires a good deal of paddling because there is little current. This scenic cruise, however, passes through the land where majestic trumpeter swans can often be sighted. No boats are allowed by the U.S. Fish and Wildlife Service before July 15, however, so nesting swans won't be disturbed. Bird watchers enjoy this trip, since bird life—including such rare species as the peregrine falcon and sandhill crane—abounds.

The float between the refuge boundary and Lima Reservoir, where swamp and marsh give way to open range, is nearly as remote. The water is flat and slow, suitable for beginners. Here, access is difficult, although county roads occasionally cross the river.

Like the refuge, this section of the river is an important waterfowl nesting area, and trumpeters can be seen. Goose hunting is good, because the birds fly between the refuge and Lima Reservoir.

Floating the section immediately downstream from Lima Dam is questionable because of the small size of the stream here. Between Lima Reservoir and Clark Canyon Reservoir (where the Red Rock becomes the Beaverhead), the river becomes winding with brushy banks. Here, trout fishing can be excellent, especially for brown trout.

Below Lima Reservoir, watch for barbed wire fences across the stream and diversion dams. Some skill is necessary to stay out of the bushes, so take the inside of the turns.

### Ruby River

The Ruby River originates in the Snowcrest Mountains and flows north for about 40 miles before reaching Ruby Reservoir. It offers little floating potential, but with small craft and skill, it can be floated. Better floating starts below the reservoir and continues for about 25 miles to the Ruby's confluence with the Beaverhead.

Although somewhat smaller, the Ruby resembles the Beaverhead with its brushy banks. This combination of abundant shore line vegetation and meandering water provides excellent trout habitat and fishermen do well, particularly for brown trout. Duck hunters also float the Ruby occasionally.

The Ruby receives fairly light floating pressure, because access is difficult. County bridges provide the only public access to this small stream. Most floating occurs between Sheridan and Twin Bridges.

The Ruby isn't difficult to float, but beginners may

spend some time in the bushes. Also, barbed wire fences and diversion dams cause problems. Rafts aren't advisable here, as maneuverability is a must. Sharp willow twigs can puncture rubber boats.

### Smith River

Towering rock formations, excellent fishing and unparalleled scenery characterize another of Montana's most popular float streams, the Smith River. Regrettably, unplanned campsites and subdivisions sprouting along this priceless river graphically illustrate the urgency of preventing human overuse of Montana's float streams.

Most floating on the Smith occurs between the department access sites north of Fort Logan—Smith River fishing access (six miles downstream) and Camp Baker fishing access (13 miles downstream)—and the bridge west of Eden. This 42-mile stretch has gained a national reputation, which accounts for the heavy pressure.

Camp Baker fishing access, the last access point before Eden Bridge, is a popular put-in spot. This float covers the most picturesque region, which divides the Big Belt and Little Belt Mountains. It usually takes three days to make the trip. Rafts and canoes are both used. Beginners can usually handle the Smith after spring run-off.

Floaters often spot wildlife—deer, black bear, raccoon, beaver and others—while cruising through this undisturbed canyon and forest country. The fortunate floater may glimpse a river otter or an elk. Indian pictographs on the limestone canyon walls add an interesting dimension to the trip.

For overnight trips, be sure to camp on public land. In the canyon area, much of the land on the east side of the river is national forest. Avoid private land near the mouth of Tenderfoot Creek. Signs mark much of the public land and the Forest Service maintains a few established campsites on the lower section.

Below Eden Bridge, the Smith widens and becomes a flat, lazy river flowing through open farm land. The scenery isn't much, but it's good fishing for brown trout in the fall. Good fishing is found on much of the Smith, which is open to year-round fishing with special restrictions on cutthroat and rainbow trout. Check fishing regulations.

While the Smith is easily floated with a minimum of experience, there are a few hazards. First, fences often cross the stream, as many as 15 in dry years but usually only 2 or 3. There's also a cable, marked by signs, that crosses the stream near the mouth of Tenderfoot Creek. Also, water levels can become low in summer, making floating impractical, so little floating is done after mid-July.

### Stillwater River

Mention the Stillwater River and somewhere a kayaker's heart beats a little bit faster, because the Stillwater is anything but still. The picturesque river, born in the lofty Beartooth Mountains, dashes madly down to the Yellowstone, providing a real challenge to the white water floater. (See white water section.) Access is good on the Stillwater, thanks mainly to eight department access points.

Above Absarokee, the river is suitable only for kayaks and sturdy rafts. However, expert canoeists sometimes try the section between Cliff Swallow Fishing Access Site and Absarokee. Floating starts as high as Woodbine Campground, but only for experienced experts. Woodbine Rapids, among Montana's most difficult, last for about two miles. The rapids at Mouat Mine are equally difficult. From Mouat Mine to Cliff Swallow, the water remains challenging. An annual kayak race that regularly attracts about 20 kayakers is conducted on the Stillwater between Beehive and Cliff Swallow. It takes about 45 minutes to cover this seven-mile course.

The lower reaches of the river (below Absarokee) can be floated year-round in either raft, canoe or kayak. Many people compare the lower Stillwater to western Montana's Bitterroot. Like the Bitterroot, the Stillwater is a broad, gravel-filled river that flows through cottonwood bottom land. This lower part requires some experience, but is suitable for intermediates. There's a tough spot about six miles upstream from Columbus.

### Sun River

Although the Sun River originates high in the Bob Marshall Wilderness, it's only floatable in the 55-mile section below Gibson Reservoir. Here, the river rushes through a narrow, shallow canyon which eventually gives way to an open valley dotted with farms and ranches.

Much of the river flows through private land with access mostly limited to a few county and state road crossings. Some private roads also provide access, but permission must be obtained.

Probably the most popular stretch for floating and fishing lies between the towns of Augusta and Vaughn. Below Vaughn, where Muddy Creek enters the river, water quality decreases and fishing worsens.

Watch for irrigation diversion dams and cottonwood snags. The best floating period is during high water in the spring and early summer. The Sun can become rather low and occasionally dry stretches are found below diversion dams later in the summer. Floating the Sun during high spring flow requires experience.

### Swan River

After rising in the Mission Mountains, the Swan River carries its pure waters through heavily timbered bottom lands before emptying into Flathead Lake near Bigfork. Although the Swan is a small river, it has floating potential for its entire distance below the Condon Ranger Station. County bridges and Forest Service roads provide adequate access.

The Swan offers water for floaters with all levels of experience. For intermediates, the river above Swan Lake offers a challenge. Don't try it during high water, however, as the Swan is strewn with log jams, many hidden behind sharp bends in the river.

Occasionally, these log jams completely block the river, necessitating a portage. Be careful on the upper reaches where several boats are lost each year. Rubber rafts aren't advisable.

Anglers do well in this upper section, particularly when bull trout run out of Swan Lake. The last few miles of the river above the lake are also popular with duck hunters. This upper part of the Swan is not heavily floated, despite its relatively undisturbed setting and abundant wildlife.

Below Swan Lake, the river flows gently except for a two-mile stretch right where the river comes out of the lake. This rough spot is only for kayakers. Beginners can float the big loop in the river, starting at the bridge east of Ferndale and ending up at the bridge west of Ferndale. Watch for the diversion dam one-half mile below this bridge. This pleasant and popular seven-mile float provides good fishing, especially in the fall.

### Tongue River

Probably the most overlooked floating stream in the state, the Tongue River offers easy paddling, excellent fishing and fine scenery. This prairie stream, which flows into Montana from Wyoming, provides a unique viewpoint for observing eastern Montana's quiet beauty for 100 miles before pouring into the Yellowstone River near Miles City.

Floating on the Tongue begins right below the Tongue River Reservoir. The fortunate fisherman might even catch a trout or two in the first couple of miles below the dam. The river winds its way through canyon land for about the first 10 air miles below the dam, and many consider this the most scenic section. After the canyon, the river flows through cottonwood bottoms with occasional rocky outcroppings. Often visible along the river banks are thick seams of coal, which could eventually determine the fate of this bountiful stream.

Wildlife is abundant along the wooded river bottoms, with plentiful deer, ducks, beaver and a wide variety of birds, including the double-crested cormorant and turkey vulture. The Tongue River fishery deserves special mention. It claims the title as one of Montana's few smallmouth bass streams and also produces northern pike sometimes weighing 15 pounds. And walleyes add to the mixed bag.

Turbid much of the year, the Tongue usually clears in August, at least in the upper reaches. Thick algae growth, particularly in the area below the dam, may hamper fishing. However, the algae usually diminishes after the first few freezes, and fishing hits its peak around mid-September. It remains good until cold weather. Spring fishing can be good during the time before run-off, from early April to mid-May.

In the lower Tongue near Miles City, anglers go

*The Blackfoot River near Missoula, one of the most heavily used floating streams. photo: Jon Keefe*

after sauger, channel catfish, paddlefish and shovelnose sturgeon. Sturgeon in the 15-pound class have been netted by fisheries workers. A dam 12 miles above Miles City blocks further migration, however.

The Tongue provides easy floating even for the most inexperienced. But keep your eyes open for cables, barbed wire and occasional diversion dams. The cables and wire can be disastrous to unwary floaters. Access is difficult in this remote country. Ask permission from landowners before crossing private land.

## Make it a Safe Trip

Although few people like to talk about it, floating in Montana can be dangerous. Not only are many streams powerful and fast, but they are also cold, even in summer. Therefore, hypothermia can be as big a danger as drowning.

Five persons died in Montana during 1976 due to floating-related incidents—two during high water. Thus, floaters must use good sense and know their abilities when floating rivers during high water. Remember, high water may last into July.

State law requires use of personal flotation devices (PFD's). Yet, only two of the five persons who died in floating accidents in 1976 were wearing PFD's.

PFD's include closed cell foam jackets, "horse collar" preservers, buoyant seat cushions and throwable safety rings. PFD's must be serviceable and be U.S. Coast Guard approved.

For canoes and kayaks, and for all rafts and river boats under 16 feet, one PFD is required for each person on board. For rafts and river boats over 16 feet, one wearable Type I, II or III PFD is required for each person on board, in addition to one throwable Type IV PFD per boat. On all crafts, any person under 12 years must wear his PFD when the craft is in motion. The law requires adults to have their PFD's readily available, but common sense requires they wear them.

Those people who enjoy moonlight floats should remember to carry a lantern on board. Anyone floating between sunrise and sunset must have at hand a lantern showing a white light which can be temporarily exhibited in sufficient time to prevent a collision.

With a few basic precautions, floating can be safe. First, know your skill. Don't try difficult rivers or any stream at high water unless you're an expert.

Second, wear your PFD. This precaution alone could save your life. That's why they're called *personal* flotation devices.

Finally, know the river you plan to float so you can match your ability to it. Rafters should particularly watch out for rivers with frequent log jams.

If these warnings scare you, (1) plan your float trip from mid-July to mid-September, (2) wear a PFD and (3) stick to the quiet streams. Your trips should be very safe.

### Yellowstone River

One of Montana's best known and most beautiful rivers, the Yellowstone comes brawling out of Yellowstone Park and flows for more than 600 miles across Montana before joining the Missouri near the Montana-North Dakota border. Replete with scenic beauty and steeped in history, the Yellowstone offers outstanding fishing and floating.

Floating on the Yellowstone begins near Gardiner where the river flows out of the park. Water in the first five or six miles below Gardiner is fast and challenging, suitable for kayaks or large rafts with experienced hands aboard. However, intermediate canoeists can handle the section from the Corwin Springs Fishing Access Site to the head of Yankee Jim Canyon. The canyon contains some very difficult white water which novices should avoid. Kayakers and rafters run the canyon, but canoeists in open canoes can't make it. (See white water section.)

Below Tom Miner Bridge, beginners often float the river in rafts and canoes. Here, the river threads through the beautiful Paradise Valley, flanked by the Gallatin Range on the west and the precipitous Absarokas on the east. The river remains an easy float all the way to Livingston. Numerous access points (including six department points) make this section available. Beginners should avoid this stretch at high water, however.

The upper river alternates between long riffles and deep pools, creating good trout habitat. From Gardiner to Big Timber the river is rated as blue ribbon trout water, and attracts anglers from far and wide.

Although trout fishing is not quite as good below Big Timber, the scenery remains superb. Here, access is more difficult, with department sites providing most of the launching places. Floaters can also put in at the new Big Timber Bridge Fishing Access Site. Other department fishing access sites include Bratten (four miles upstream from Reedpoint), Indian Fort at Reedpoint and Itch-kep-pe at Columbus. Each July, a Livingston to Billings float attracts many participants.

Although the Yellowstone is fairly gentle compared to most Montana streams, there are still hazards. Weirs and diversion dams can cause problems for the incautious floater. The river frequently splits, so watch for tricky currents where the channels rejoin. Also, side channels can be blocked with fallen trees. Floaters can usually paddle around difficult spots.

The Yellowstone River below Billings to the North Dakota border is one of Montana's great untapped recreational resources. Winding through wooded bottom lands shaded by rocky bluffs, a lower Yellowstone trip offers solitude and easy floating.

Fishing can be very good, particularly at the mouths of the streams that join the Yellowstone and below diversion dams. The Yellowstone is basically a warm water fishery below Billings, with walleye, sauger, northern pike, channel catfish, shovelnose sturgeon and paddlefish creating a fisherman's smorgasbord. Waterfowl hunting is also good, particularly where the Bighorn River joins the Yellowstone. Be sure to check local regulations on where to hunt because some areas along the river are closed to waterfowl hunting.

Although organized float trips are conducted each year between Forsyth and Miles City, the lower river is usually devoid of people. Access is more difficult than on the upper river, but highway bridges and occasional department points suffice.

# The White Water Challenge

Should you hear someone speaking of "haystacks" and "rooster tails," they might not be talking about the old homestead. These are common words in the vocabularies of Montana's dedicated corps of white water enthusiasts. Here are a few of the most popular white water streams:

**Blackfoot River**—The best white water on the Blackfoot lies between 9 Mile Prairie Fishing Access Site (about four miles downstream from the Scotty Brown Bridge) and McNamara Landing at Johnsrud State Park. This water is very challenging for canoeists—especially early in the season. It becomes easier later on.

The rapids in the area of Bear Creek Flats are usually considered the most difficult on the river. Only expert canoeists should attempt them.

Kayakers often play in the rock gardens near the Roundup Bar Bridge. Intermediate canoeists sometimes test their skills from this bridge down to Johnsrud State Park. Floaters in open canoes shouldn't try this section during run-off because it's too tough.

**Gallatin River (main stem)**—The upper parts of this river are accessible, but extremely difficult to float. While canoeists will find the section from Taylor Fork (of the main stem Gallatin) down to the West Fork very challenging, the real white water section lies within the lower Gallatin Canyon, downstream from the West Fork. This part of the river is only for experts and only the very best experts should try the two-mile section below the highway bridge at Cascade Creek. Rafters and kayakers often draw crowds from the highway as they attempt the treacherous House Rock Rapids in this two-mile section.

Best floating on the main stem Gallatin lasts until about mid-July. After that, the river becomes low.

**Stillwater River**—The Stillwater has over 30 miles of top quality water. Thus, it attracts expert kayakers and some rafters from all over the state. The upper stretches of the river, including Woodbine and Chrome Mine rapids, are strictly for super experts and have only been run a few times. They are not runnable at the peak of spring run-off. Below Mouat Mine, there is good kayak water (too tough for canoes) all the way to the Cliff Swallow Fishing Access Site. This section of the river is popular with both expert and intermediate kayakers, because the frequent rocks and fast currents call for constant maneuvering.

Expert canoeists may want to try the run from Cliff Swallow down to Absarokee. Watch for log jams and snags.

**Madison River**—Anybody talking about Madison River white water is referring to the well-known Bear Trap Canyon, two miles downstream from Ennis Reservoir. The Bear Trap contains big, heavy water and is doubly dangerous because of its inaccessibility. Although the difficult rapids are often separated by long stretches of flat water, the Bear Trap is only for experts in kayaks or large rafts. Open canoes don't have a chance.

For those with less experience, the tough rapids can be portaged. The most difficult is Bear Trap Rapids, the last major rapid before leaving the canyon.

This beautiful trip through Bear Trap Canyon is popular for several reasons. First, the water flow is controlled by Madison Dam and stays good all year. Also, the water is warm in summer because of the dam. High temperatures are bad for fish, but good for floaters.

**Yellowstone River**—While kayakers often test their skills in the fast moving water near Gardiner, the Yellowstone River's most popular white water spot is Yankee Jim Canyon, which starts about 10 miles downstream from Gardiner. Although not as tough as Bear Trap, it's still challenging for both experts and intermediates in kayaks and rafts. The canyon has been successfully run in an open canoe, but this is only for the most daring. Although Yankee Jim is more difficult early in the year, it remains runnable through fall.

**Clark Fork River**—Cyr Canyon near Alberton provides the Clark Fork's top white water excitement. The Clark Fork is characterized by high water that creates tricky currents and hydraulics. Although it's often run by experts in spring, most agree fall is the best time. In spring, many of the challenging runs are washed out by high water, leaving unnegotiable whirlpools and big standing waves.

This very tough spot is suitable only for kayaks and large rafts operated by experts. An outfitter

*A storm threatens to upset a peaceful float down the Missouri. F&G photo: Dick Ellis*

conducts float trips through the gorge. Floaters in open canoes should stay away. One of the first major rapids—known as "the Boateater"—has claimed the crafts of several foolish people.

**Swan River**—Although the popular white water section of the Swan is only a mile long, it deserves special mention. Starting right below the dam just east of Bigfork, the Swan plummets 100 feet in the course of a mile, an unbroken stretch of extremely difficult water strictly for experts.

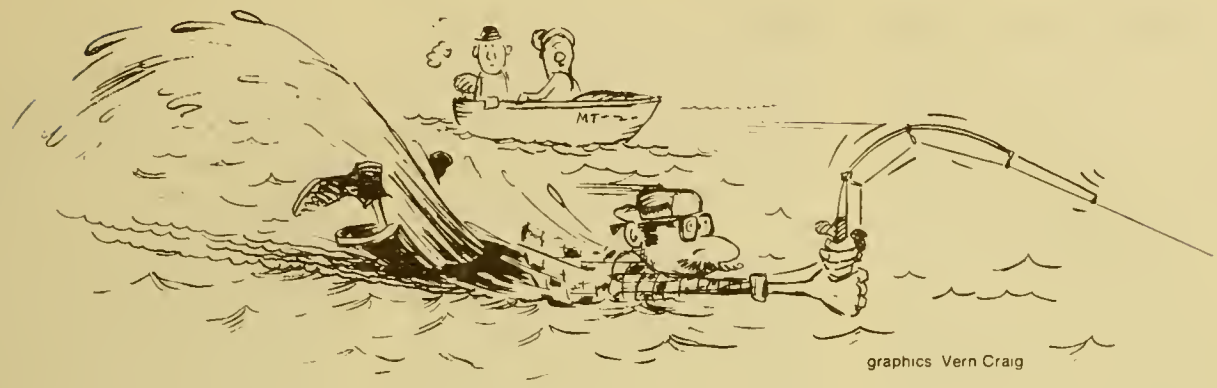
Floaters should inspect the entire mile by foot before attempting this formidable stretch. Rafters usually aren't able to pull out to scout ahead. Even kayakers have difficulty pulling out. This stretch is also dangerous because rocks have sharp edges because of fairly recent blasting. Kayakers often make the run three or four times a day.

**Middle Fork of the Flathead**—Although the wilderness section of the Middle Fork is renowned for its white water, lower sections are naturally more popular because of easy access. Most of the Middle Fork is popular, but the John Stevens Canyon (a five-mile jaunt from Nyack Flats to West Glacier) is heavily used by kayakers and rafters. Here, the canyon restricts the river to a narrow thread as it drops rapidly over rocky ledges. It descends through the canyon, losing an elevation of about 35 feet per mile. Both rafts and kayaks make the trip. This difficult water is suitable for intermediates as well as experts.

**North Fork of the Flathead**—The chilly North Fork also offers some exciting water, particularly between Big Creek and the Blankenship Bridge. Although it's particularly popular with rafters and kayakers, hardy souls in open canoes also make this run. The most difficult spot is Fool Hen Rapids, about two miles upstream from Canyon Creek. Experts in open canoes negotiate these rapids, but standing waves as high as five feet make dunking quite likely. The rapids can be easily portaged.

Rafters and kayakers usually have minimal difficulty with this beautiful section of river. It's suitable for intermediates. ■

# You Can Break These Montana Fishing Records




Since the last update of state fishing records, anglers have established new records for three species: burbot (ling), goldeye and kokanee salmon.

To enter the 1977 competition, catch a fish bigger than the one listed. Then follow these rules:

(1) Weigh the fish on a government-tested scale such as those in grocery stores or meat markets.

(2) If possible, weigh the fish in the presence of a department employe. (An affidavit stating length and weight from the store at which the fish was weighed is acceptable.)

(3) The fish must be correctly identified. If you're in doubt, contact a department fisheries biologist to verify the trophy's identification. (A photograph clearly showing all characteristics will usually suffice.)

(4) Information—length, weight, how caught, date caught, body of water in which caught, nearest town and name and age of fisherman—should be sent to the Environment and Information Division, Dept. of Fish and Game, 1420 East Sixth; Helena, MT 59601.

Good luck!

| Species | Weight | Angler | Year | Location |
|---|---|---|---|---|
| Brook trout | 9 lbs. 1 oz. | John R. Cook | 1940 | Lower Two Medicine Lake |
| Brown trout | 29 lbs. | E. H. "Peck" Bacon | 1966 | Wade Lake |
| Black crappie | 3 lbs. 2 oz. | Al Elser | 1973 | Tongue River Reservoir |
| Bluegill | 2 lbs. 8 oz. | George Schlosser | 1967 | Dengel Reservoir |
| Burbot (ling) | 12 lbs. 9¾ oz. | Tom Colgan | 1977 | Missouri River |
| Coho | 4 lbs. 14 oz. | Irven Stohl | 1973 | Fort Peck Reservoir |
| Cutthroat trout | 16 lbs. | William D. Sands | 1955 | Red Eagle Lake |
| Channel catfish | 21 lbs. 5 oz. | Gary Eppers | 1964 | Missouri River |
| Dolly Varden | 25 lbs. 10 oz. | James Hyer | 1916 | unknown |
| Drum | 13 lbs. 6 oz. | George Gallagher | 1973 | Fort Peck Reservoir |
| Golden trout | 2 lbs. 9 oz. | Raymond D. Gallik | 1975 | Lightning Lake |
| Goldeye | 1 lb. 13 oz. | Damon Rush | 1976 | Nelson Reservoir |
| Grayling | 2 lbs. 10 oz. | Mark Daniels | 1974 | Handkerchief Lake |
| King salmon (chinook) | 4 lbs. 7 oz. | Berry Gillis | 1972 | Missouri River |
| Kokanee salmon | 5 lbs. 15 oz. | Forrest L. Johnson | 1976 | Pishkun Reservoir |
| Lake trout | 41 lbs. 8 oz. | John E. Boller | 1975 | Flathead Lake |
| Lake whitefish | 1 lb. 9½ oz. | Jere Hightower | 1976 | Flathead Lake |
| Largemouth bass | 7 lbs. 6 oz. | Jere Hightower | 1973 | Ninepipe Reservoir |
| Mountain whitefish | 4 lbs. 2½ oz. | Bob Johnson | 1973 | Clark Fork River |
| Northern pike | 37 lbs. 8 oz. | Lance Moyler | 1972 | Tongue River Reservoir |
| Paddlefish | 142 lbs. 8 oz. | Larry Branstetter | 1973 | Missouri River |
| Pallid sturgeon | 42 lbs. 4 oz. | Allen Schrimsher | 1975 | Fort Peck tailwaters |
| Rainbow trout | 20 lbs. | C. J. Brohaugh | 1952 | Cliff Lake |
| Rainbow-cutthroat hybrid | 17 lbs. 10 oz. | R. A. Rousselle | 1973 | Ashley Lake |
| Sauger | 7 lbs. 2 oz. | Raymond V. Johnston | 1975 | Tongue River Reservoir |
| Shovelnose sturgeon | 8 lbs. 12 oz. | Leo Chapel | 1974 | Missouri River |
| Smallmouth bass | 4 lbs. 11½ oz. | Bob Higson | 1975 | Horseshoe Lake |
| Walleye | 14 lbs. | Neil Berg | 1974 | Nelson Reservoir |
| White crappie | 1.72 lbs. | Ken Walcheck | 1972 | Tongue River Reservoir |
| White sturgeon | 96 lbs. | Herb Stout | 1968 | Kootenai River |
| Yellow perch | 2 lbs. | Gerald Pottratz | 1974 | Nelson Reservoir |



recycled paper

# Dear F&G

## Weed War Has Two Sides

I was interested in the article by Noel Rosetta in the Jan./Feb. 1977 *Montana Outdoors*. It seems that each spring as the snow begins to melt and the days become longer and warmer, the controversy over weeds and their control begins anew. As with every discussion, there are two sides and, in this case, the two sides are diametrically opposed. It appears that once again it is a situation of the environmentalists vs. agribusiness.

Both viewpoints ignore at least some of the following:

(1) "Weeds" are living plants that are not, by their own nature, harmful. Weeds are plants that are a problem only in the "eye of the beholder."

(2) Weeds of concern (at least in Montana) are those which primarily affect productivity of range and cultivated lands and to a lesser degree human health (poison ivy) or livestock (halogeton).

(3) Most "weeds" have been introduced to the North American continent and, as such, are not subject to natural biological controls that are generally present in their native lands.

(4) Man by his very activities (cultivation, road building, cities, etc.), in addition to natural phenomena (earthquakes, volcanoes, floods), creates disturbed habitat ideal for invasion by "weeds." These plants are pioneer species (annual plants that can withstand rigorous conditions) and are capable of invading and existing on hot, dry and barren sites.

(5) Weeds can cause demonstrable losses to the farmer-rancher and with the higher costs of production and lower commodity prices, a program of no control is economic suicide.

(6) Herbicides are not the total answer to weed management problems. An integrated approach to the problem, of which herbicides would constitute one of the tools, should have priority research. Little, if any, meaningful research is presently being directed at utilizing an integrated pest management program for weed control.

(7) Weeds are not bad everywhere they occur. Eradication of weeds from large areas is a fond hope of some; however, management of local weed populations which threaten the direct economic welfare of people is a more practical approach.

(8) There is a difference between a "weed" and a "noxious weed." The definition of a weed which I prefer is: "A weed is any living plant which by its presence reduces land use for man's benefit." To the farmer, a weed would be wild oat plants in his wheat field; the rancher would consider St. John's-wort a problem to his livestock; the hiker would consider poison ivy a threat to his comfort; the railroader would consider vegetation on the tracks a fire hazard, etc.

The definition does not preclude the same plant which is a "weed" to the farmer from being a source of enjoyment to the passing motorist. Herein lies the crux of the matter—a weed to one person is a plant with special meaning to another. Most "weed" plants fit this description.

The "noxious plant," however, is generally trouble for the landowner. The most appropriate definition for a noxious plant is: "A noxious plant is any weed plant capable of becoming established in a suitable habitat either by seed, root part or modified stem, which may render land unfit for use, may be damaging to livestock or wildlife or may be injurious to humans."

Plants which fit the criteria of this definition (leafy spurge, Canada thistle, Dalmation toadflax and several others) are usually declared by law to be a problem requiring concerted landowner and governmental action to aid in their control. Noxious plants are not always a problem to the poor land manager, but if well-managed land is invaded, its value may be significantly reduced. Noxious plants are aggressive, adaptable plants that will outcompete native plants. This inherent factor of these plants requires the land manager to develop an especially well-managed control program if he is to succeed in reducing infestations of these plants. The minimum time period required to reduce an infestation is five years and control of an infestation will require ten to twenty years. Management costs are high, but loss of land use to these plants is much higher.

Montana has had a weed law on the books since the 1930s. In 1969, the Montana Weed Law was amended by directing each county in the state to form a Noxious Weed Control District for the express purpose of controlling only those plants which have been declared noxious in each county. Generally, noxious plant control in the state has failed to accomplish the original intent of this legislation—a reduction in the number of acres infested with noxious plants. In fact, just the opposite has occurred.

An increase in the number of acres infested with noxious plants has resulted for a number of reasons:

(1) inadequate surveys to pinpoint infestations within each county.

(2) lack of coordination on county-county and county-state levels to control problem weeds within a multicounty area.

(3) limited personnel involved in weed management at the state level.

(4) lack of understanding by private, state and federal landowners that noxious plant management must begin on each individual's land.

(5) reliance on herbicide formulations to control noxious plant populations without conscientious investigation of alternative management methods.

(6) declaration of weed plants at the county level as "noxious" which do not fit the definition of noxious weed. Some native Montana plants are included.

(7) lack of adequate funding at the county level.

(8) lack of adequate planning at all governmental levels.

(9) failure by the public to understand that noxious plants in sufficient population densities reduce agricultural crop yields.

Management areas which need improvement by people involved with noxious plant control are:

(1) basic knowledge and understanding of plant physiology and morphology (plant form and structure).

(2) better and more specific training in field identification of target plants.

(3) basic knowledge about herbicides and application techniques.

(4) improved program planning and development.
(5) an act which places primary responsibility for noxious plant control with the landowner.

By the time this letter is printed, the 1977 session of the Montana Legislature will be history. During this session, the lawmakers will have considered the proposed Montana Noxious Plant Management Act which will replace the current Montana Weed Law. Essentially, this act would require that counties establish reasonable goals designed to reduce infestations of noxious plants in agricultural lands. The proposed act intends to achieve this goal by motivating individual landowners rather than relying on local weed control personnel to do the major share of the required control work. The act also allows counties to set aside areas within the county where noxious plant control is economically or environmentally unjustified.

I believe that counties faithfully implementing this act will reduce the number of acres infested with noxious plants in an orderly, responsible and environmentally safe manner without contamination of waterways, loss of wildlife habitat or creation of human health hazards. The act is designed to assist agricultural interests. Those charged with responsibility for this program must keep these interests foremost in their thoughts and actions. The time is past when irresponsible land management can be tolerated. If this program is to succeed, each of us must keep in mind what the program is designed to do and who the program is intended to help.—*David W. Armstrong III; Helena, Mont.*

• *The Montana Noxious Plant Management Act (SB 315) was killed on second reading in the Senate on Feb. 22, 1977. Weed control provisions are also embodied in HB 122, the so-called "local government code." The Senate, in effect, killed consideration of the bill this session when too few senators voted to suspend the rules which would have allowed the bill to be formally brought before the body for full hearing and discussion.*—Ed.

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Noel Rosetta's timely article (Jan./Feb. 1977) on herbicide use brings to the public's attention a very pressing problem that should be of concern to all of Montana. Right now, during the winter months, the problem lies dormant with the season. We can be sure, though, that this problem is being nurtured by weed control districts and readied for another spring catastrophe.

As I see it, the problem Mr. Rosetta points out to the people of Montana is twofold. First, that after years of hard work and continuous spraying efforts, Montana's rights-of-way and access road areas are still infested with weeds and very little vegetation of an important nature is remaining. Second, that over the years of continuous spraying, Montana is millions of dollars and thousands of birds, trees and shrubs poorer.

It is evident that weed control problems are more serious today than in past years. Due to increased acreage under agricultural production, increased mileage of roads and access areas, the advancement of irrigation to more areas and the encroachment of small acreage subdevelopments, the problem of controlling the spread and growth of weeds increases each year. What can we expect as a solution to this continuing problem? Increased weed control budgets and thousands of extra gallons of herbicides are not the solution and they are not the answer that Montana is looking for.

Montana needs a crash program to rewrite the weed control practices and laws. No longer can counties use broadcast spraying techniques to control weeds in rights-of-way. We are looking at an era currently when in the spring months, there is a 2,4-D fog that covers an entire area from Calgary to Denver. Weed control districts must start using selective spraying techniques aimed at condensed patches of weeds and not at thousands of miles of scattered weeds in roadsides containing beneficial vegetation and wildlife.

Montana's present weed control practices are not working. We are not stopping the spread of weeds nor are we controlling the current weed problems. A short drive out into most rural areas of Montana will prove this.

I agree with Mr. Rosetta; we must reduce the vast waste of resources and dollars that goes to finance weed control projects. We must find a better solution to our weed control problems that will benefit Montana's countryside and not just some large chemical company. —*Jerald L. Anderberg; Manhattan, Mont.*

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In your Jan./Feb. 1977 issue, your magazine and Noel Rosetta attack present weed laws. True, the present law might be outmoded and some weeds might be used by game animals. But "noxious weeds" such as leafy spurge and whitetop must be kept in check. If nothing is done to control leafy spurge, then all we will have is leafy spurge, less grass, less beef to eat, less wheat for bread, etc.

I have personally observed deer going around an area of leafy spurge because they couldn't walk through it because it was too thick and dense. Of what value is that area of ground?

Mr. Rosetta states in his article that county commissioners can add any plant to the list of noxious weeds. That is not a true statement, and I'm sure he knows it.

The Judith Basin County weed crew uses selective spraying and is doing the best it can to stop the spread of noxious weeds. The crew uses no 2,4,5-T and I seriously doubt if it is used in Lewis and Clark County; 2,4,5-T is used as a brush killer, not for weed control.

One area in which noxious weeds originate is national forests, because nothing is done to control them. The water moves the weed seeds down and out into farm areas, and adds to making weed control on private land an almost losing battle.

Remember that everyone who eats is involved in agriculture and agriculture must try to combat weeds to produce food. —*Michael Biggerstaff; Stanford, Mont.*

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Noel Rosetta's article in the Jan./Feb. 1977 *Montana Outdoors* expresses the sentiments of many Montanans. The all-out use of chemicals has accomplished little except the waste of taxpayers' money and elimination of populations of fish and wildlife.

The Kicking Horse Reservoir banks, pool side and downstream, have been sprayed seasonally for years and still the weeds continue to grow.

The feeder canal from Kicking Horse into Ninepipe Reservoir used to be a prime bass, trout, perch and sunfish nursery frequented by multitudes of fishermen of every age. This past summer it was once again a browned-out biological desert through which runs a water course barren of catchable fishes.

We blame Canadians and Mexicans for killing more than their share of migratory waterfowl, but it is Montana weed control law that insists we expose these wildlife resources to teratogenical chemicals that result in

reduced hatches locally and in the nesting marshes of Canada.

We need our weed control districts, but they must abide by their own law and protect fish and wildlife. Weed infestations are range condition indicators.

It would seem much more logical to revamp the chemical weed warfare units into agriculturally beneficial units devoted to introducing beneficial cover capable of growing quickly and profusely on disturbed soils. What would be wrong with planting Douglas-fir along problem areas of canal banks? Weeds don't grow in needle duff. The shallow roots of fir don't transpire much water, and some could be harvested as a cash crop of Christmas trees at intervals. The algae and evaporation problems would be cut down through shading of the water. We would have better fishing. Ducks, pheasants and beneficial song birds would have better nesting habitat and there would be built-in weed control.

There must be a better way than total chemical "control." That obviously doesn't work except to breed increasingly chemical-tolerant strains of weeds. *—Dave and Peg Harriman; St. Ignatius, Mont.*

## Which Way is it Going?

In the Sept./Oct. 1976 issue, you printed a photo of an antelope by Jon Cates. The photo is captioned, "Which Way is it Going?"

Well, several residents of the Darby area would like to know the answer. Will the photographer tell us if the antelope is coming or going? We have watched subsequent issues for an answer but have found none. This photo has fostered many arguments and we would appreciate an answer from you.—*Donna Huckstadt; Darby, Mont.*

•*Photographer Jon Cates assures us the antelope was running away from his camera.*—Ed.

## Decker Article Decreases Conflict

Bill Schneider's article, "A Day at Decker" (Sept./Oct. 1976), was indeed worthy of publication. True, the report was a deviation from *Montana Outdoors'* usual articles, but one that may lead to a dampening of harsh feelings that sometimes occur between developers and environmentalists. Decreased conflict between such groups is necessary if we are to establish a working relationship.

The article expressed a seemingly genuine cooperation between Decker Coal Co. and regulatory agencies, which is encouraging. Although reclamation laws and Decker's own efforts to maintain a quality habitat may have come too late to minimize current impacts, I feel that if Decker is sincere in its efforts to monitor the effects of mining, it should be commended and further encouraged to preserve wildlife habitat in its future activities. *—Dennis J. Schwehr; Billings, Mont.*

## Ban Motorbikes

I heartily agree with the letter (Jan./Feb. 1977) from Joy Lewis of Basin, Mont. regarding the motorbike situation. There must be something done, maybe *banning* them (motorbikes) in the mountains.

We live up here on the South Boulder River. We take our camper trailer in the summer and fall to Mammoth and camp. Oh my! It's quiet and peaceful for awhile, until the silence is broken by motorbikes passing or going back and forth up the roads or pathways—it's awful. We are senior citizens and love the forest and mountains and the peace and quiet. It's devastating. We think the only solution *is* to ban them. Why don't you have a poll on the situation?

People go up there to target practice too, which shouldn't be allowed. One wonders if one is going to be hit some time with a stray bullet. *—Mr. and Mrs. Sky Collins; Cardwell, Mont.*

# Contributors

In the United States, about $55 million is spent each year to control mosquitoes. Last year in Montana, about $400,000 was expended to control the pesky insects. Unfortunately, most of the money was spent on insecticide control—control that resulted in decreased fish populations in streams, decreased crop yields, declining bird populations, harm to livestock, etc. But as **Randall F. Moy** points out in his article, "Controlling Mosquitoes," research has led to new methods of control which depend less on chemical poisons and more on safer methods such as biological control. Moy recently resigned his position with the Dept. of Health and Environmental Sciences to become research specialist for the Montana Energy Resource Policy Office. He holds B.A. and M.A. degrees in zoology, both from the University of Montana, Missoula. Turn to page 2 to find out why every Montanan feels the mosquito's bite.

Who doesn't dream of escaping, of "getting away from it all," when the tempo of living becomes too hurried and harried? **Hank Fischer** has an answer. Put a canoe or raft in the nearest river, lie back, let the sun warm your body and let your troubles float away as the river opens up before you. But if you don't know enough about floating—such as where to float, how to select a craft, safety measures, what to do about crossing private land, what books or magazines to read to find some answers—*Montana Outdoors'* Recreation Guide may start you on your way. Turn to page 13 for "The Floater's Guide" and a promise of adventure around the next bend. After several months as MO's intern, Fischer is working as a writer and editor with Defenders of Wildlife in Washington, D.C. His undergraduate program at Ohio University, Athens, emphasized English and he has done graduate work in environmental studies at UM.

Step right up and place your bets. The game is oil and gas leasing in Montana. The losers in this game might be Montana's wildlife, wilderness areas and you—a member of the public concerned about the quality of your outdoor experiences. Pick a mountain range—parts of the Crazies, Bridgers, Madisons, Beartooths, Little Belts, Big Belts, Highwoods, Big Snowies, Pioneers, Gallatins and several others have pending leases. In coming months, federal and state agencies will make far-reaching decisions on oil and gas leasing throughout Montana. Without close monitoring by a concerned public, more than 2 million acres of prime wildlife habitat could be lost. In "Oil and Gas Leasing" on page 41, MO's intern, **Hugh Zackheim** asks if Montana can afford to gamble for such high stakes. Zackheim is working toward an M.S. in resource conservation in UM's School of Forestry. He holds a B.A. in biology from Harvard University in Cambridge, Mass.

# Oil and Gas Leasing

## Can Montana afford to Gamble?

by Hugh Zackheim
illustrations by Donita Sexton

"Ladies and gentlemen, place your bets."

"Sixty thousand acres in the Beartooths. Eighty thousand in the Crazies."

"Can't win if you don't try. Get 'em down and make 'em high."

"I'll take 200,000 in the Great Bear. Give me 400,000 in the Flathead."

"Last call, bet it all. When it spins, someone wins."

"Half a million in the Beaverhead. Seven hundred thousand in the Rocky Mountain front."

"Round and round she goes and where she stops nobody knows. . . ."

* * *

The above scenario aptly describes recent developments in the quiet, but popular, game of oil

and gas roulette in Montana. The players are the power companies, independent investors and lease brokers; the bets are oil and gas leases, and the figures represent acres of land.

As for strategy, the players hope to cover the board with bets (i.e., cover the state with leases) to insure a healthy pay-off if oil or gas is found. The ante is small compared to the possible pay-off and, apparently, the players like the odds.

The Forest Service (FS), the Bureau of Land Management (BLM) and the Dept. of State Lands (DSL) represent the "house" in this speculative game. The house decides which bets to accept and on what terms. For the moment, the house is keeping the bets small and deciding how much of the larger action it can handle. After these choices are made, the wheel will spin and the players will learn just how lucky or smart they are.

But the stakes in the leasing gamble cannot be measured solely in barrels of crude oil or cubic feet of natural gas. The pending lease applications cover more than 2 million acres (over 3,000 square miles) of prime wildlife habitat across Montana. The applications include the open ponderosa deer ranges near Ashland in the southeast, the grizzly country in the Flathead and the east front regions of the northwest, the game-rich mountains in Beaverhead County in the southwest and the productive antelope ranges in the northeast. Parts of the Crazy, Bridger, Madison, Beartooth, Little Belt, Big Belt, Highwood, Big Snowy, Gravelly, Whitefish, Pioneer and Gallatin ranges have pending leases. Even designated and proposed wilderness areas, other roadless lands and critical game winter ranges have not escaped leasing speculation.

In the coming months, federal and state agencies will make far-reaching decisions on oil and gas leasing throughout Montana. Without close monitoring by a concerned public, a big win for lease speculators could result in a big loss for wildlife.

Recent interest in oil and gas leasing in Montana has focused on the geologic formation known as the "overthrust belt," which underlies 19 counties statewide, extending from Gallatin and Beaverhead in the south to Flathead and Glacier in the north. (See map.) The belt is characterized by a network of structural "traps," generally from 9,000-15,000 feet underground, some of which may contain natural gas or oil.

In February 1976, Amoco Production Co. (a subsidiary of Standard Oil Co., Indiana) struck a major oil field in the overthrust formation in southwestern Wyoming. This discovery came on the heels of a Utah strike in the same formation and led to a flurry of oil and gas lease applications in Montana's section of the overthrust belt.

Helena National Forest officials, who had observed no previous interest in oil and gas leasing, received filings for 125,000 acres in a three-week period. Beaverhead National Forest authorities have received applications for over 370,000 acres since the Wyoming strike, more than three times the previously pending acreage. In addition, personnel in DSL have recently processed applications on over 121,000 acres in Beaverhead and Madison counties and about 10,000 acres in Lewis and Clark County, all of which were on or near the overthrust belt.

Similar leasing frenzies have hit FS and BLM land along the east slope of the Rockies and essentially all public land in that area—about 700,000 acres—is now covered by lease applications. And the speculation had a spinoff effect, resulting in lease offers in several central Montana mountain ranges not actually part of the overthrust belt. (See "Scorecard.")

Most of these recent lease applications are still pending because of unfinished environmental impact statements and land use plans. However, the decision-making process has advanced, particularly in the Flathead. What has happened there presents a firsthand introduction to the prospects and the problems of oil and gas leasing throughout Montana.

Action on oil and gas leasing along the overthrust belt in the Flathead National Forest preceded most other lease applications in western Montana by about a year. In February 1975, the FS received applications from Texas Pacific Oil Co. for leases on 236,000 acres along the North and South forks of the Flathead River. The lease applications covered some of the area's best big game winter range, choice spawning streams and prime backcountry, including parts of the Bob Marshall Wilderness, lands bordering Glacier National Park, lands recently designated under the Wild and Scenic Rivers Act and other roadless areas.

In a report on potential impacts of oil and gas leases in the Flathead, Mark Ahner, planning forester for the Flathead County Areawide Planning Organization, said initial seismic *exploration* would have little adverse environmental impact—as long as activity was restricted to existing roads. "Thumper" trucks would send vibrations through the ground; the vibrations, in turn, would be recorded by ground sensors and analyzed by computer. Should these seismic tests indicate the likelihood of natural gas or oil, *development* would probably begin. Unlike exploration, development would pose serious environmental questions.

According to Ahner's report, a natural gas strike could mean one well per square mile, with each well requiring a six-acre clearing. A refinery, covering some 40-60 acres, might be built to remove sulfur and other impurities from the gas. Three water holding ponds would be needed to process water used by the refinery, which could amount to some 28,000 gallons per day. An extensive pipe line system with 40- to 50-foot rights-of-way would be necessary to transport the gas from well heads to refinery and from refinery to distribution points. Roads and power lines would accompany natural gas development. An oil strike would lead to slightly different development, with more wells, pipe lines, roads and collecting stations, but probably no refinery.

All this development translates into fish and

## Scorecard

| Pending Federal Oil and Gas Leases in Montana | Total Acres Pending |
|---|---|
| **Beaverhead National Forest** | **495,000** |
| ■ Gravelly, Pioneer, Snowcrest and Tendoy Mtns. | |
| **Custer National Forest** | **270,000** |
| ■ Ashland Division, Beartooth Face, Beartooth Plateau | |
| **Flathead National Forest** | **396,000** |
| ■ North and South forks of the Flathead River, Great Bear Wilderness Study Area, Whitefish Mtns. | |
| **Gallatin National Forest** | **160,000** |
| ■ Bridger, Crazy, Gallatin and Madison Mtns. | |
| **Helena National Forest** | **125,000** |
| ■ Big Belt Mtns., Scapegoat Wilderness | |
| **Lewis and Clark National Forest** | **570,000** |
| ■ Big Snowy, Castle, Crazy, Highwood, Little Belt Mtns.; Great Bear Wilderness Study Area, Bob Marshall and Scapegoat Wildernesses | |
| **Lolo National Forest** | **25,000** |
| ■ Scapegoat Wilderness | |
| **Butte District, Bureau of Land Management** | **100,000** |
| ■ East front of the Rockies | |

wildlife habitat loss. In addition to physical destruction of vegetation, Ahner's report said significant pollution problems could result. Stream sedimentation would accompany construction activity and additional water quality problems could result from oil spills or natural gas leaks. Important spawning areas for Dolly Varden and cutthroat trout could be seriously damaged. Sulfur emissions from the refinery would leave a noxious odor and possibly harm vegetation. The report also mentioned noise pollution, which would be an added stress to wildlife.

Flathead National Forest officials spent four months gathering information before issuing preliminary recommendations on the leases in a June 1975 draft environmental impact statement (EIS). Following a three-month public comment period and an additional six months of revision, the FS issued its final EIS in April 1976. In that document, the FS recommended leasing 91,000 acres to Texas Pacific. "No surface occupancy" stipulations, prohibiting any above ground activity, were attached to 32,000 of these acres. (Areas with "no surface occupancy" can be developed by wells drilled at an angle from adjacent leased areas, a process known as directional drilling.)

One complaint directed at the final EIS was its failure to fully consider public opinion. During the public comment period between the draft and final EIS, the FS received almost 400 letters, of which only 1% supported issuing the leases. The letters came from local residents uneasy about effects of development on their land and life styles, from citizens throughout the country concerned that leasing would compromise a recreation area of national significance and from biologists and researchers worried about the impact on wildlife.

Tom Hay, regional coordinator for the Dept. of Fish and Game in Kalispell, wrote, "Nearly everything associated with an operation of this kind will be to the detriment of the fish and wildlife resource." Charles Jonkel, leader of the Border Grizzly Project in Montana, noted, "The areas of the proposed oil leases comprise some of the very best remaining grizzly habitat in northwestern Montana," and recommended that leases be denied, or at least deferred until more information was available. And the Northern Rocky Mountain Wolf Recovery Team warned of adverse impacts on the area's endangered wolves.

Some changes were made between the draft and final impact statements. Notably, about 73,000 acres was deferred from lease consideration because of concern for endangered species habitat. But public and professional concern that *any* development would compromise wildlife, recreational and economic values was by-passed in the final recommendation.

Significantly, the EIS focused on the seismographic exploration phase of the leases and essentially ignored possible impacts of further exploration and development. The lease, however, grants the right to explore for *and develop* oil and

gas.

In the FS' own words, the impact statement included only "a brief description of the activities that will take place in the development and production of oil and/or gas." The FS justified this once-over lightly approach, saying, "In the event a discovery is made and development is proposed, an additional environmental impact statement will have to be prepared." What the FS neglected to mention is once the lease is granted, it allows future development in spite of what a later EIS might reveal. The later EIS could influence details of development (such as road or pipe line siting), but could not prevent development. By recommending the leases be granted before impacts are fully disclosed, the FS would remove the option of saying "no" long before the public had a clear picture of what development would mean.

However, because of a successful administrative appeal filed in August 1976 by the Flathead Coalition (a Kalispell-based citizens' group), the final EIS was not the last word on the disputed oil and gas leasing in the Flathead. The appeal asked the FS to defer the leases at least until water quality, wilderness and wildlife studies in the area were completed. In addition, the appeal detailed 11 legal arguments on the statement's inadequacy. The arguments included the EIS' failure to address developmental impacts of the leases, lack of real consideration of alternatives to granting the leases (particularly the alternative of government exploration for gas prior to any leasing) and the fact that Texas Pacific, a wholly owned subsidiary of a Canadian corporation (The Seagram Co., Ltd.) might be ineligible to hold leases on federal lands in the United States. Jon Heberling, Kalispell attorney who prepared the legal brief for the coalition, said, "Only one of the 11 arguments has to hold up for the impact statement to be overturned in the courts. And we believe each argument can stand independently."

On Feb. 9, 1977, Robert Torheim, regional forester

## Oil Development—Handle With Care

For more than a dozen years, farmers and ranchers in Sheridan, Daniels and Roosevelt counties have battled with state agencies and oil companies to stop saline pollution of ground water. The landowners claim careless drilling and water storage techniques from oil development have rendered well water unfit for drinking, changed pastures into unproductive salt flats and converted excellent waterfowl habitat into brackish waste water.

M. K. Botz of the health department's Water Quality Bureau says the "complex nature of underground water flow and the tangled and changing interweave of mineral ownership, well drilling, facilities construction, lease ownership and production responsibility" make proving responsibility for the salt contamination "like nailing jello to the wall." However, Botz explains, during drilling of oil wells, underground brines are brought to the surface, piped to storage ponds and, in most cases, re-injected into disposal wells. In each of these stages, Botz notes, a potential exists for brines to mix with fresh water supplies through accidents or careless procedures.

Thanks largely to the efforts of about 100 farmers and ranchers who banded together to form the Northeastern Montana Land and Mineral Owners Assn., some improvement is being made. Donald Chisholm, administrator of the Oil and Gas Conservation Division, says a public meeting held at the request of the association served to "put the oil companies on notice" to comply with regulations on oil development. Association chairman Arnie Nelson says laws which had gone unenforced, despite repeated protests by local landowners, are now being generally upheld by the Oil and Gas Conservation Division. Most important, holding ponds are being supplied with impermeable liners to prevent the mixing of saline and fresh water. But, Nelson adds, "After 15 years, it's kind of late." The association now faces the task of soliciting state support for efforts to reclaim salt-polluted lands. Whether ground water supplies will again be suitable to drink is not known.

Water pollution problems also occurred in the Elk Basin oil field, 60 miles southwest of Billings. Retention dams designed to prevent oil from entering nearby streams were not properly maintained. As a result, large quantities of oil entered streams and flowed down the Clark's Fork into the Yellowstone River.

Oil seepage from a refinery near Laurel has also polluted the Yellowstone. After a particularly bad incident, Dept. of Fish and Game fisheries biologist Clint Bishop said, "You could taste the phenols [chemical compounds associated with oil] in the fish caught in the Yellowstone River.

Most of the problems in the Elk Basin and Laurel areas have now been corrected. However, these instances, along with saline pollution in northeastern Montana, indicate the potential dangers to water and wildlife from careless oil production. As Botz says, "Whenever you produce oil, you have the potential for enormous amounts of environmental pollution. It's extremely important that companies use the utmost in technology to guard against this."

for the FS' Northern Region, responded to the Flathead Coalition's appeal by remanding the EIS to the forest superviser and ordering the Flathead National Forest to gather additional information on the impacts of oil and gas development and add that information to the final EIS. In a letter to Flathead Forest Superviser E. L. Corpe, Torheim wrote, "The information in the statement does not give me an adequate evaluation of the possible effects of development on the environment to allow me to properly evaluate your decision."

Details of how the EIS will be revised are unclear and no timetable was given for its completion. Public comment may again be solicited by the Flathead forest when the new information is released. Whether new information in the impact statement will result in new recommendations on the lease applications remains to be seen. Meanwhile, lease applications have been filed on another 160,000 acres in the Flathead National Forest.

Just across the Continental Divide from the Flathead National Forest is the east front, a land whose timbered slopes and rolling foothills host a diversity and abundance of wildlife. From the southern boundary of Glacier National Park, one can travel south through the Great Bear Wilderness Study Area, Bob Marshall Wilderness and Scapegoat Wilderness, a distance of almost 100 miles, without so much as seeing an improved jeep trail. Presently, most of this public land, more than 700,000 acres, is covered by pending lease applications.

The leasing boom in the east front came in response to general interest in the overthrust belt and some specific indications this area might overlie natural gas deposits. During the 1950s, a capped well in the Lewis and Clark National Forest's Blackleaf Canyon on the east front tested to as much as 6.3 million cubic feet per day. One Canadian field in the overthrust belt within 12 miles of the Montana border is estimated to hold reserves which could supply Montana's natural gas needs for 50 years at current consumption rates. According to a recent report by the U.S. Geological Survey, "These fields in Canada are important to note because the structure, stratigraphy [layering] and geologic history are similar to the disturbed belt of northwestern Montana." The report concludes there is "good potential" for oil or gas in the disturbed belt of northwestern Montana, which includes both the Flathead and east front regions.

Over half a million acres of the pending lease applications along the east front is part of the Lewis and Clark National Forest. The draft land management plan for the forest's Rocky Mountain Unit, which encompasses most of the recent applications, will be out this spring, according to FS officials. Although the plan was unavailable when this article went to press, preliminary reports from the Lewis and Clark National Forest indicated the plan would recommend about 138,000 acres for oil and gas leasing, with 92,000 of these allowing surface occupancy.

Parts of the nine inventoried roadless areas are covered by the leasing recommendations. The four general sites proposed for exploration and potential development are the Badger Creek-Two Medicine River area, the Dupuyer Creek-Blackleaf Creek area, Sun River Canyon and the Ford Creek-Elk Creek area. Included is year-round habitat for elk, white-tailed and mule deer, bighorn sheep, mountain goats, moose, grizzly and black bears, mountain lions and a host of smaller mammal, bird and fish species.

In a paper presented at the Fourth International Conference on Bear Research and Management in Kalispell in February, Allen Schallenberger, wildlife biologist working with the Border Grizzly Project, reviewed the impact of oil and gas exploration and development on grizzly bears. Schallenberger's conclusion could not be more pertinent to the situation on the east front. "The greatest impacts appear to be associated with the construction of roads into previously unroaded areas and increased use of the land by people," he wrote.

The direct impacts of bringing roads and people into grizzly habitat include illegal shooting of grizzlies, growing dependence by bears on garbage and other unnatural food sources and harassment of bears by people on motorized vehicles, Schallenberger noted. If development of oil or gas proceeds hastily, further loss of habitat is probably inescapable, he concludes, as is reduction of big game populations which provide the bear with an important spring food resource.

However, consequences of roading an area may extend well beyond these direct impacts. Schallenberger cites spinoff activities—such as logging, subdivision and recreation development—that accompany new roads. Such activities increase contact between man and bear and, as Schallenberger observes, "when sufficient confrontations occur, they have ultimately reduced grizzly bear habitat and populations."

Under the Lewis and Clark National Forest's preliminary recommendations, most exploration would be restricted to the few existing roads in the area and to now closed roads built for seismographic testing in the 1950s. In addition, the FS is considering staging the leases, so only parts of the leased area will be under development at a given time. However, as Lewis and Clark National Forest Planner John Skinner acknowledges, "If oil and gas are developed, there's no question that additional roads would have to be built." Moreover, the seismographic roads of the 1950s, which have largely revegetated, would be completely overhauled. To accommodate drilling rigs, the new and rebuilt roads would be constructed to handle semitrucks with loads exceeding 20 tons. Undoubtedly, such avenues of development in the rugged east front could have substantial impacts on wildlife populations.

The Beaverhead National Forest, second only to Lewis and Clark National Forest in pending leases, issued a draft land use plan with environmental statement in February. The plan did not directly

address the more than 490,000 acres covered by oil and gas lease applications, except to say, "After completion of the final land management plan and environmental statement, the lease applications will be reviewed. . . ." As Beaverhead National Forest Planning Coordinator Orville Grossarth explains, if the plan calls for development of an area, then issuing oil and gas leases there might be recommended. In areas designated to remain unroaded, he continues, the FS will probably deny oil and gas leases. Grossarth adds, however, that the FS may decide to issue leases in unroaded areas. If so, he says an environmental statement will be prepared and public comment solicited.

Currently, the Beaverhead forest is 70% roadless. Under the proposed management plan, "almost half" will remain undeveloped and unroaded. That represents a reduction of about 400,000 acres from existing roadless acreage. With such massive changes in land use under consideration, it is too early to tell how and when specific lease applications will be processed by the Beaverhead National Forest. Future FS decisions on lease applications in the Gravelly, Snowcrest, Pioneer and Tendoy ranges merit careful public review.

The status of recent lease applications on other federal land is, for the most part, undetermined. Within the next three years, land use plans and oil and gas lease recommendations will be opened to public comment. (The "Scorecard" and accompanying map highlight some of the pending leases.)

The surge of interest in federal oil and gas leasing has been paralleled on lands managed by the state. In April 1975, the Dept. of State Lands received an offer from Texas Pacific to lease 7,759 acres in the Coal Creek State Forest, adjacent to the company's pending lease applications along the North Fork of the Flathead. The area shares the valuable fishery and wildlife resources of the surrounding FS lands and is a popular recreation site.

Proposed leasing in the Coal Creek State Forest was considered a "major action" by the Dept. of State Lands. As a result, the lands department and the Dept. of Natural Resources and Conservation (which manages state forests) prepared an EIS, issuing the final version in February 1976.

Public comments to the EIS ran strongly against the sale. Kalispell resident R. G. Larsen spoke for many who felt possible oil or gas development would destroy the wild and rustic character of the North Fork. In an apt metaphor, Larsen wrote, "To my way of thinking this would be like opening a gas station in a cathedral." Others opposed the lease sales on grounds that fossil fuel development along the North

Fork would undermine attempts to halt proposed coal mining in Cabin Creek, just across the Canadian border. The Flathead Coalition asked, "How can the United States assert that the mine drainage in British Columbia would pollute the Flathead waters and violate the treaty [with Canada] when we pollute the rivers ourselves?"

Ultimately, the State Board of Land Commissioners unanimously rejected the Coal Creek lease offers, in response to low bids for the tracts and overwhelming public opposition to the sale. Oil and gas lease offers on other state lands, however, have not been afforded the public comment and environmental review that helped prevent the Coal Creek sales. A case in point was the Beaverhead-Madison "land rush" which followed the oil discovery in the Wyoming overthrust belt.

In August 1976, DSL received lease applications for 256 tracts of land in Beaverhead and Madison counties. The department withdrew about one-fourth of these tracts from consideration because aerial photos revealed no road access or the presence of steep slopes, important waterways or timber. Remaining, however, was more than 88,000 acres which included elk habitat, antelope and mule deer winter range and a sage grouse strutting ground.

To conduct a study of the impacts of leasing and potential development over such large and widely separated areas would require months—DSL had 35 days until the next auction was scheduled and the department had made no effort to postpone the sales. In somewhat of an understatement, DSL's preliminary environmental review noted, "In the time available, a thorough analysis of wildlife on each specific application was not possible." Faced with this wholesale leasing of important wildlife habitat, the Dept. of Fish and Game filed a successful last-minute petition with DSL to postpone final sales until more information on the area's wildlife could be reviewed.

When the leases were finally acted on, many contained stipulations to protect wildlife habitat, such as seasonal restrictions on activity on winter ranges and protection of stream beds and flood plains. Twenty-five tracts, covering about 10,000 acres, have been temporarily withdrawn and will undergo additional environmental review. While the stipulations and withdrawals did answer some of the concerns of the Dept. of Fish and Game, the crisis atmosphere in which the Beaverhead situation was resolved, and the almost total exclusion of the public from the process, do not always promote land management responsive to the needs of wildlife.

Brace Hayden, environmental coordinator for DSL, says steps are being taken to insure review of environmental impacts before leasing. Applications are now routinely forwarded to Dept. of Fish and Game regional offices and a statewide assessment of oil and gas leasing is planned. But, Hayden notes, with over 5 million acres of potentially leasable land administered by DSL and 500-600 tracts offered a year, the department is faced with a difficult task.

This article addresses the serious environmental effects of oil and natural gas development in Montana. Most of the recent interest in speculating for oil and gas has been in the "overthrust belt," an unusual geologic formation running diagonally northwest to southeast through western Montana and into Wyoming and Utah. In the Wyoming section of the overthrust belt, Amoco has discovered an oil field which has been heralded as the biggest strike since Prudhoe Bay in Alaska. But what about the natural gas that often occupies the same geological formation as oil? According to a recent article by the New York Times News Service, "The natural gas—although plentiful—is currently burning away in a bright orange flame because Amoco says a pipe line to utilize it would be too costly."

"The biggest problems are time and staffing," Hayden says. "It's as if the oil and gas lease applicant had the upper hand."

An additional barrier to full consideration of wildlife with current lease speculation is lack of knowledge about Montana's oil and gas reserves. Even in the Flathead and east front, which appear most promising geologically, nobody knows if the areas under application overlie any oil or gas. And since the oil and gas industry considers drilling deep wells an exploration process, it is conceivable an area could be badly scarred—*before* it has even been determined if it contains oil or natural gas.

Citing lack of hard evidence to confirm presence of these fuels on lands under lease application, BLM geologist Dave Fredley says, "The whole oil and gas picture in the state is nebulous." Dale Zimmerman, chief of the Mineral Resources Division of the BLM in Washington, D.C., adds, "The way it stands now, they don't know if there's any oil or gas there or not." Still, oil companies and lease brokers are busy trying to tie up all lands which have even a remote possibility of paying off.

This speculation creates some difficulties for resource managers, particularly managers of wildlife habitat. The basic problem is how can environmental impacts of an oil and gas lease be accurately assessed when nobody knows what the lease will mean. Are there oil or gas deposits in the leased area? If so, where? What techniques will be used to develop them? Without any knowledge of the location or extent of the resource, the scale of development and the impacts can only be guessed.

The final EIS on leasing in the Flathead underlined this problem, stating, "At this time [before oil or gas reserves are known], there is no accurate or exact means by which impacts or alternatives can be determined." Because of this uncertainty, the Flathead National Forest staff initially did not

include a detailed assessment of development impacts in its environmental statement. The recent order to revise the EIS to include developmental impacts will give the public more information but will not remove the guesswork from the process. According to Bob Gibson, long range planner for the Flathead National Forest, the revised EIS will require "a lot of estimating, projecting and hypothesizing."

Beaverhead National Forest Planning Coordinator Grossarth notes some of the same problems in trying to assess oil and gas lease impacts. If the mineral resource were known, Grossarth says, "then they [the oil companies] can come in with a site-specific request saying, 'I want to drill here,' and we can evaluate it." The way it is now, Grossarth adds, the FS is unable to address the impacts with much accuracy because there is no way of knowing where development might occur or how extensive it will be.

Arnold Foss, department game manager in Bozeman, sums up the feelings of wildlife biologists when exploration crews are "tromping around" good wildlife habitat. "It makes you nervous," Foss says, "because you really don't know what they're going to do."

One solution to this uncertainty is to learn what and where the resources are before approving lease applications. As Jim Cumming, Columbia Falls attorney and chairman of the Flathead Coalition Legal Committee, says, "It seems to me we could find out the mineral reserves first, then issue the leases on a competitive basis. The government would then have some control over the development of these sensitive areas."

The federal structure, at least, seems moving in this direction. Mineral Resources Division Chief Zimmerman says the new BLM Organic Act, passed by Congress in late 1976, reaffirms the agency's mandate to assess the mineral reserves on public lands. Zimmerman adds, "I don't think there's any question now—we've got to inventory the resource." Whether the program will affect pending oil and gas leases in Montana depends on the level and timing of the funding now being appropriated in Washington. However, Zimmerman notes, there are no plans to postpone action on the lease applications until such an inventory is completed.

As an alternative to a federal resource inventory, the industry could assess the reserves. To do this without committing the land to future development would necessitate "splitting" the oil and gas lease, i.e., separating the exploration phase from the development phase. In the event oil or gas were found, the managing agency would then be in a

## The Rules of the Game

Currently, Montana has more than 10 million acres under federal oil and gas leases, and another 2 million acres under state leases. The majority of these 12 million acres is east of the Rocky Mountains, but recent interest in leasing elsewhere has given the issue statewide importance. The following is a brief explanation of the procedures, agency responsibilities and opportunities for public participation in decisions on oil and gas leasing in Montana.

Under both Montana and federal law, oil and gas are classified as leasable minerals. Private individuals or corporations can apply to the Bureau of Land Management (BLM) to acquire oil and gas rights held by the federal government and to the Dept. of State Lands (DSL) for state holdings.

The DSL holds four auctions yearly at which tracts under application are sold to the highest bidder. The minimum acceptable bid is $1.50 per acre per year and, over the last five years, bids have averaged about $2.90 per acre per year.

The decision to issue or deny oil and gas leases on state land rests with the State Board of Land Commissioners, which includes the governor, attorney general, superintendent of public instruction, state auditor and secretary of state. The DSL, however, is responsible for reviewing the environmental impacts of the lease applications. So far, only one lease offer—the proposed leasing in the Coal Creek State Forest just west of Glacier National Park—has been considered a "major state action" by the DSL, requiring an environmental impact statement and allowing public input. Thus, most state leases are approved without public involvement or extensive environmental review. Significantly, under a provision of the Montana Environmental Policy Act, DSL can require the lease applicant to pay for impact studies on proposed leasing. This provision could insure more thorough environmental review of oil and gas leasing, but has not been used by the DSL to date.

Leasing procedures and rental fees on federal lands vary, depending on the geology and leasing history of the land. Recent lease applications in western and central Montana are primarily on lands which have never previously been leased and which do not overlie *known* oil or gas reservoirs. As a result, any leases granted on these 2 million pending acres will be issued to the initial applicant for $1 per acre per year.

These federal leases, like the state leases, are issued for 10 years and can be extended beyond that as long as oil and gas are being produced in "paying quantities." On both state and federal leases, the lessee must pay the government royalties, amoun-

position to accurately assess the impacts of development on wildlife and other environmental values. A decision on whether to allow development and, if so, where and how, could then be reached. The uncertainty inherent in the present system would be eliminated because consequences of issuing the lease would be public knowledge before the lease was granted.

What are the chances of instituting a "lease splitting" system for state or federal oil and gas leases? State BLM Director Edwin Zaidlicz acknowledges lease splitting is under consideration by the U.S. Dept. of the Interior but says, "Nothing's come through yet."

On the state level, Leo Berry, Jr., land department commissioner, says legislation would probably be required to change present lease terms. However, Berry adds, "We should take a look at lease splitting in the future."

For now, the apparent shortage of natural gas and the call for increased domestic oil supplies have led to pressures for action on oil and gas leases. The pressures have taken many forms, including:

- a Chevron protest that the FS environmental review was causing a "totally unreasonable" delay in the Crazy Mountains,
- repeated inquiries on oil and gas leasing in the Sun River Game Range west of Great Falls, a vital winter range purchased by sportsmen and
- an oil industry columnist complaining about the "environmental extremists" holding up leases for grizzly bear studies.

"It's mounting," state BLM Director Zaidlicz says. "The squeeze is going to be on us and the Forest Service."

Lease applicants are growing impatient for the game to begin. They are anxious to pay their money for lease rentals and take their chances on finding oil or gas.

But the risks of leasing are far from clear to the people of Montana. Uncertainty about oil and gas reserves makes the impacts of issuing leases difficult to assess. The terms of the lease raise questions about control of development in environmentally sensitive areas.

The upcoming decisions on oil and gas leasing will affect future management of more than 2 million acres of public land in Montana. Fortunately, most agency recommendations will be open to comment. They deserve the attention of all Montanans. Without a strong public voice, large areas important for wildlife habitat and wild land recreation may be gambled away. ■

ting to at least 12 ½%, on any oil or gas produced on leased land. Both state and federal leases allow the lease holder to explore for, develop and sell any oil or gas under leased land. According to the terms of the federal lease (the state lease is almost identical), "The lessee is granted the exclusive right and privilege to drill for, mine, extract, remove and dispense of all the oil and gas deposits . . . in the lands leased, together with the right to construct and maintain thereupon all works, buildings, plants, waterways, roads, telegraph or telephone lines, pipe lines, reservoirs, tanks, pumping stations, or other structures necessary to the full enjoyment thereof."

This free hand in development is tempered on both the federal and state levels by provisions which allow the managing agencies to attach stipulations to oil and gas leases. These stipulations range from details of road siting to seasonal restrictions of activity on big game winter ranges to a "no surface occupancy" policy prohibiting activity on the surface of the leased land. The U.S. Geological Survey regulates production and drilling on federal leases while the Board of Oil and Gas Conservation monitors development of state leases.

The state office of the BLM has authority to issue or deny leases on all federal lands in Montana, except Indian reservations. If a lease applicant disagrees with the BLM's decision, he may appeal to the Interior Board of Land Appeals (an administrative law body within the Dept. of the Interior) and eventually to the courts. If a citizens' group dislikes BLM's action, an appeal must be filed directly through the courts, as citizens don't have access to the Interior Board of Land Appeals.

Applications for oil and gas leases on Forest Service (FS) land are forwarded by the BLM to the headquarters of the appropriate national forest for environmental review and recommendations on how the leases should be handled. The review and recommendations may take the form of an environmental impact statement on oil and gas leasing or may be included as part of a land use plan. In either case, the public has the opportunity to comment between issuance of the draft and final versions of the recommendations. If dissatisfied with the final recommendations, citizens may initiate an appeal through the FS and eventually pursue the appeal in the courts.

While technically the BLM in not bound by FS recommendations, those recommendations are important to the BLM's decision. As Bud Lee, chief of the lands and minerals branch of the Montana BLM office, explains, BLM must consider the impacts of leasing and the fact that the FS environmental review is an "essential part" of this process.

Most pending leases on FS land have been considered major actions, requiring detailed environmental impact statements. Thus, the public will have the opportunity to comment on agency proposals between issuance of draft and final versions of the statements. However, the amount of influence these public comments will have on oil and gas leasing decisions remains at the discretion of the managing agency.

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